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Original Articles

Multiple Visceral Resections

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ADMITTEDLY, a visceral resection must have for its purpose the saving of the patient's life, and this can be done only by complete removal of diseased and offending tissue. The rehabilitation of the patient and the prevention of recurrence of the lesion, be it benign or malignant, are also primary considerations. The abdominal surgeon is confronted increasingly with the necessity of extirpating not only a single viscus, but, more than occasionally, multiple viscera, if full restoration of the patient is ever to be attained. The increasing frequency with which this problem has presented itself has led us to a study of 80 patients in whom two or more viscera were necessarily sacrificed in the attempt to achieve complete eradication of diseased tissue.

Over the years we have been inevitably impressed and molded by the bold surgical work and thought of such men as Lahey, Brunschwig, Sugarbaker, Hunt and others. Many factors have contributed to the safer execution of more extensive intra-abdominal procedures. Foremost among these is the fine skill developed by the modern physician-anesthesiologist. Of inestimable value is his ability to choose and direct the anesthetic agent or group of agents, which not only convey the patient through the operation with a minimal risk but permit a more complete and unhampered execution of the operator's technical facility and judgment. Present also, and of great importance, are such things as the ready availability of blood for replacement and an increased appreciation of water and electrolyte balance, and measures for its control. Last, the antibiotics are a factor, but these, in our opinion, are definitely of lesser importance.

Our series of 80 patients whose advantage we felt could best be served by the removal of two or more viscera consisted of 30 whose lesions were benign and 50 who had malignant disease not limited to the viscus of origin.

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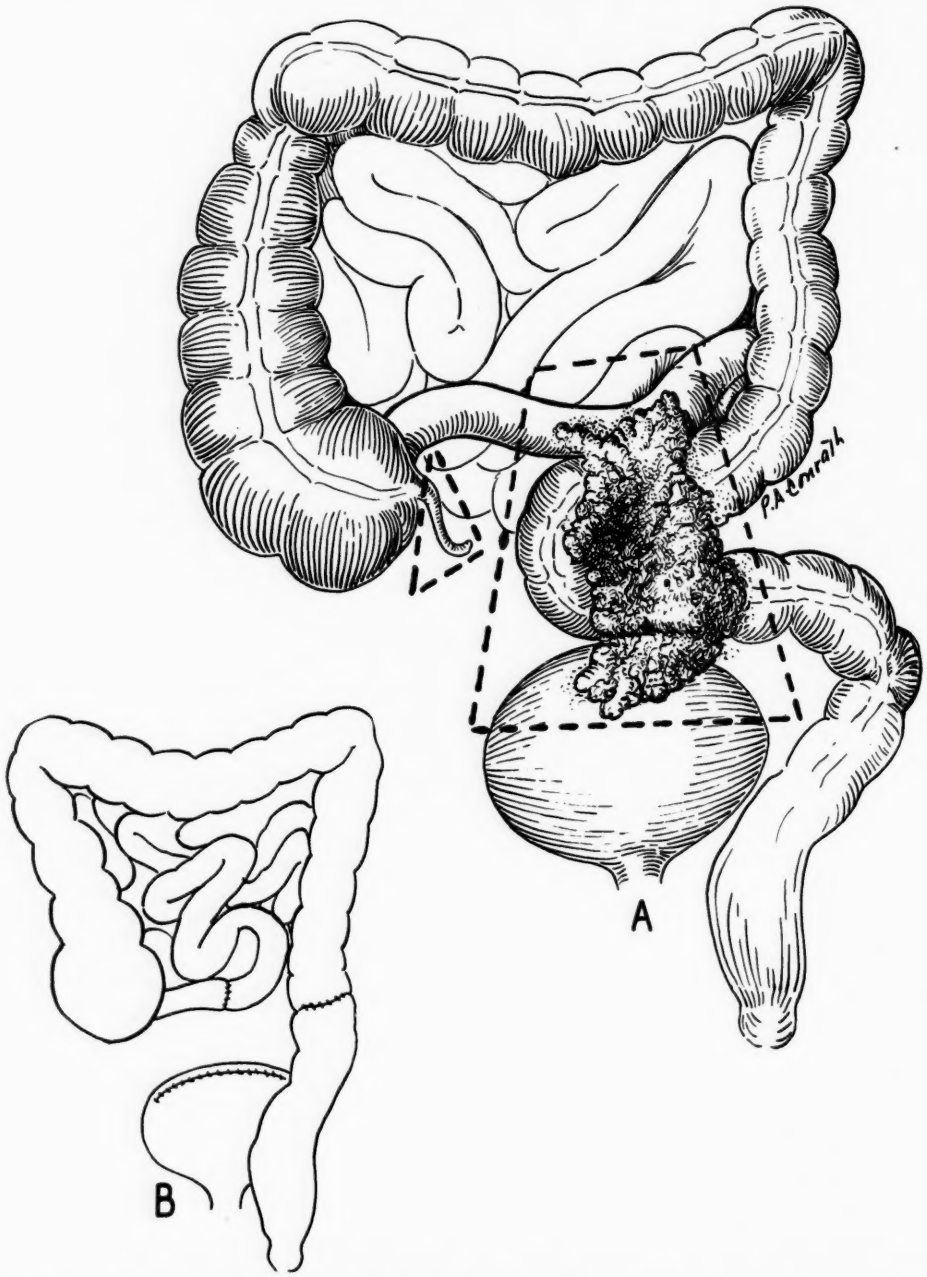

Fig. 1 *(Case 14)*.—T.B. *A*, carcinoma of the sigmoid colon involving the distal ileum and urinary bladder. Dotted lines indicate viscera resected. *B*, method of reconstruction. Single one-stage procedure.

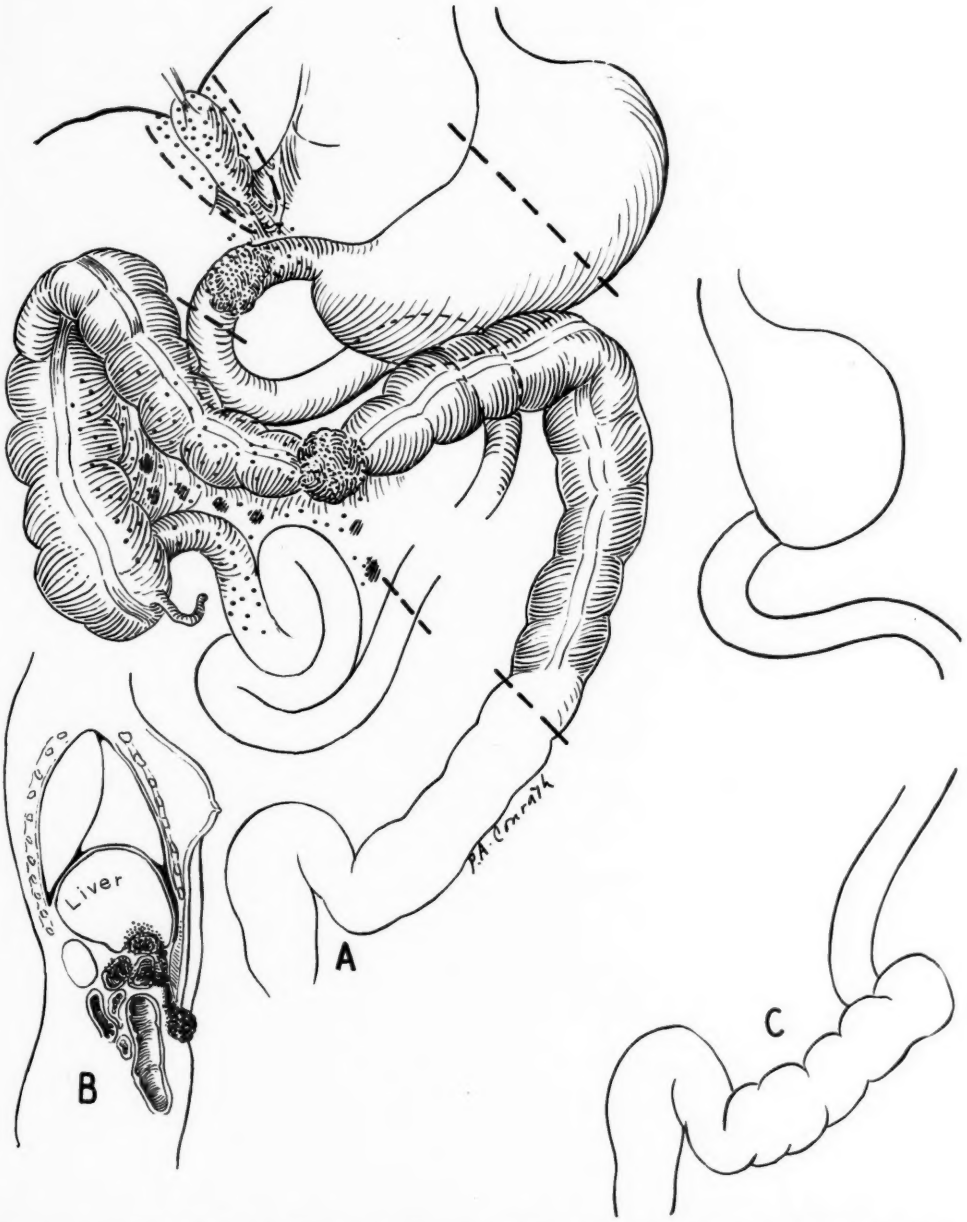

Fig. 2 (*Case 20*).—B.P. Carcinoma of transverse colon with metastasis to anterior abdominal wall, stomach, duodenum, liver and transverse mesocolon (*A* and *B*). Resection of the abdominal wall, ascending, transverse and descending colon, duodenum and stomach, portion of the liver and gallbladder. *C*, method of reconstruction. Single one-stage procedure.

MULTIPLE RESECTIONS FOR BENIGN LESIONS

One might well question the soundness of a judgment that would dictate a combination of visceral resections at one time rather than a single resection on separate occasions. However, the judicious choice of a simultaneous dual surgical exercise may not be indiscreet if all pathologic tissue is removed, leaving none to complicate further the postoperative period. We have been additionally fortified in this thought by the instances in which we have observed a smoldering viscus flare into an aggressive pathologic unit during the immediate postoperative course. A rupture of the gallbladder occurring at the end of one week in the

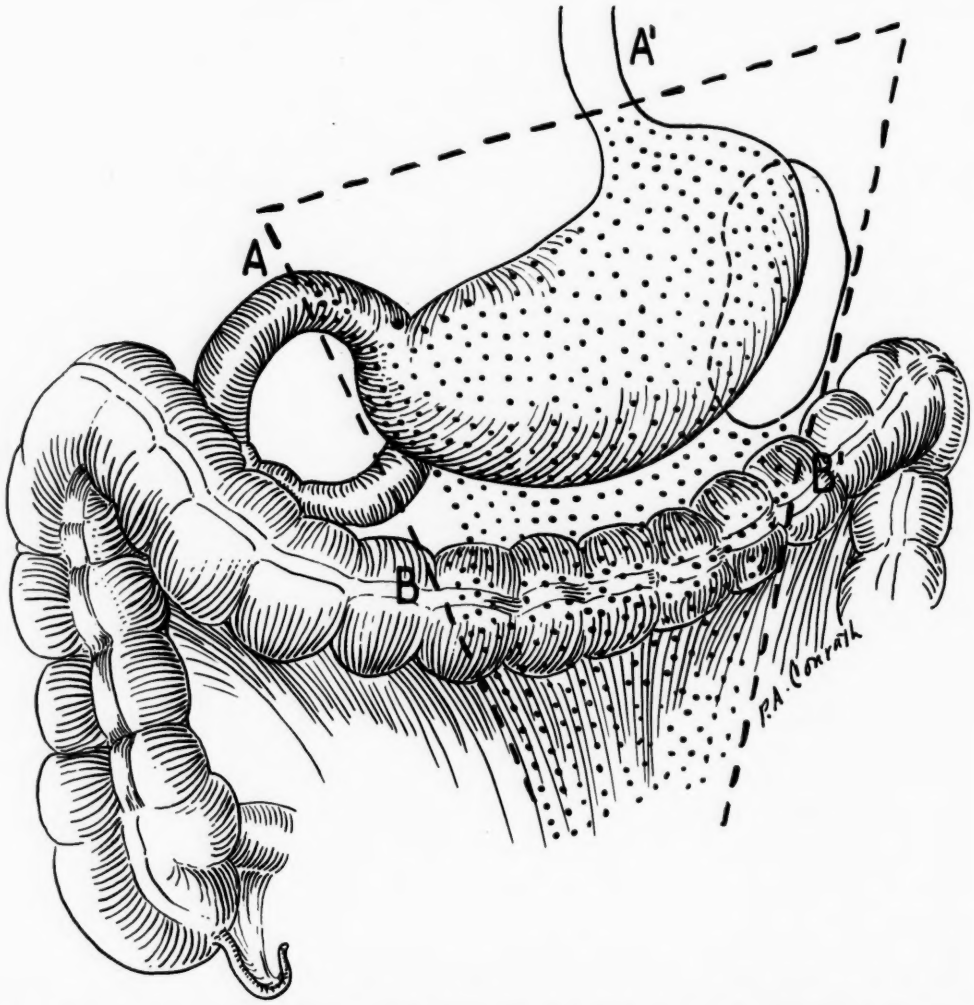

Fig. 3 (*Case 22*).—L.O. Carcinoma of the stomach with metastases to the transverse colon and spleen. Total gastrectomy, splenectomy, and resection of transverse colon. Continuity restored by esophagoduodenostomy and end-to-end anastomosis of colon. Single one-stage procedure.

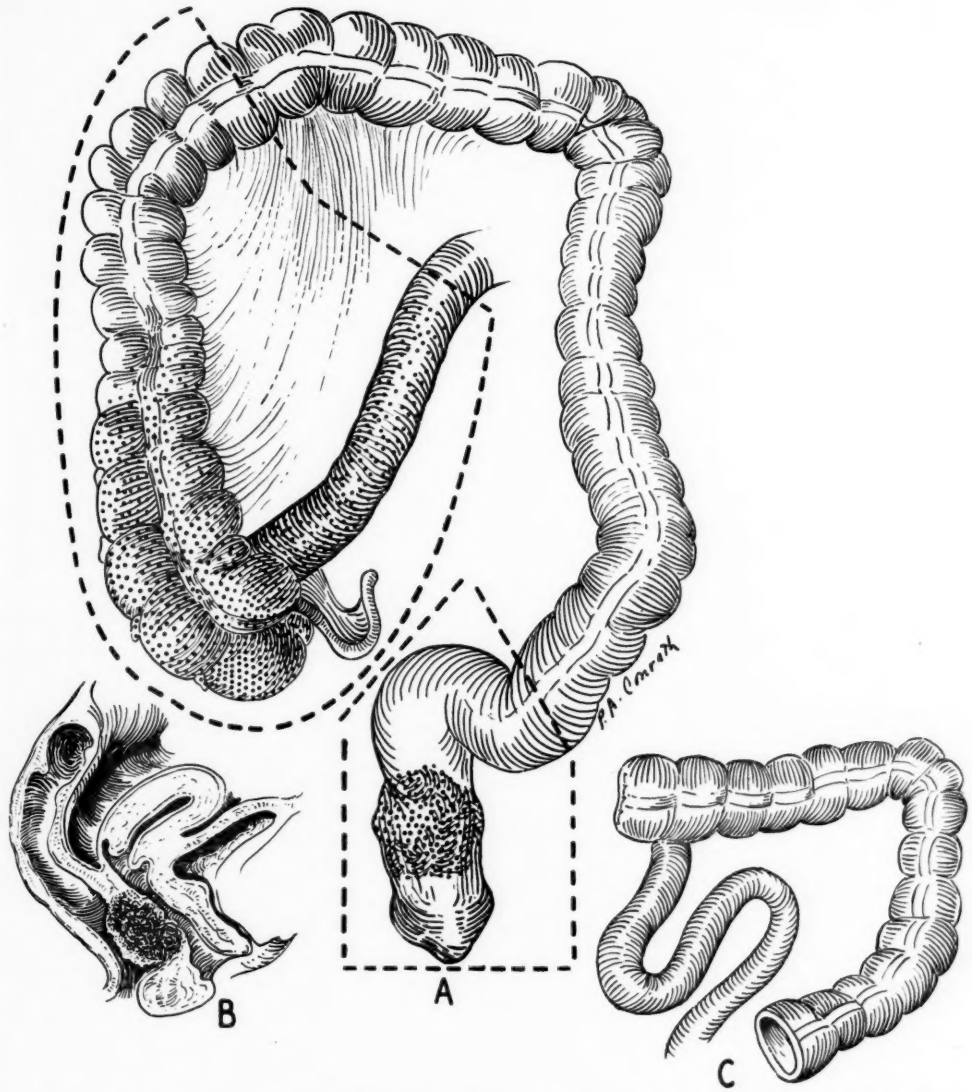

Fig. 4 (*Case 24*).—R.W. Advanced regional ileocolitis involving distal ileum and right half of transverse colon (*A* and *B*). Carcinoma of rectum ulcerating through posterior vaginal septum. Dotted lines indicate viscera resected. (Distal 4 feet of the ileum and right colon, sigmoid colon, rectum, anus and vagina.) Operation completed in two stages. *C*, method of reconstruction.

gastrectomized patient, as well as the inflammation and perforation of an appendix immediately after gastrectomy and again after colon resection, has been observed. The strangulation of an ovarian cyst after cholecystectomy and the intussusception of ileum occasioned by Meckel's diverticulum as an almost immediate sequel to hysterectomy have combined to urge the elimination of multiple benign

TABLE 1.—*Multiple Resections for Benign Lesions*

Case No.	Age	Sex	Diagnosis	Viscera Resected Primarily	Viscera Resected Concomitantly	Operative Procedure and Method of Reconstruction	Result	Survival Period
15 (H.D.)	37	F	Uterine nyomas Ulcerative colitis Bilateral ovarian cysts	Entire colon, rectum and anus	Uterus, tubes and ovaries	Permanent ileostomy—abdominoperineal resection Total colectomy Total hysterectomy	Alive and well	5 years 8 months
28 (R.L.)	38	F	Obstruction of signoid colon due to endometriosis Uterine fibromyoms	Sigmoid colon	Uterus, tubes and ovaries	Resection of sigmoid colon—primary end-to-end anastomosis Total hysterectomy Bilateral salpingo-oophorectomy	Alive and well	1 year 7 months
34 (J.B.)	41	M	Progressive enterocolitis involving colon and small intestine with multiple abdominal wall sinuses	Entire ilium and right and left halves of colon	.....	Ileosigmoidostomy—primary end-to-end anastomosis	Alive and well	7 years 6 months
42 (C.G.)	57	M	Multiple, traumatic, ileal and jejunal fistulas	Ileum and jejunum	.....	Ileojejunostomy—primary end-to-end anastomosis	Alive and well	2 years
43 (M.G.)	56	F	Cholecystoduodenal fistula Ileal fistula Cholecystitis with stones Common duct obstruction	Ileum	Gallbladder	Resection of ileum and primary end-to-end anastomosis Cholecystectomy and choledochotomy Closure of duodenal fistula	Alive and well	3 years 6 months
44 (G.J.)	41	F	Chronic pelvic inflammatory disease Pelvic endometriosis Endometriosis of the ileum	Uterus, tubes and ovaries	Ileum	Total hysterectomy Bilateral salpingo-oophorectomy Resection of ileum—primary end-to-end anastomosis	Alive and well	2 years 6 months
50 (J.A.)	62	M	Duodenal ulcer perforating into the pancreas Chronic cholecystitis Cholelithiasis	Stomach and duodenum	Gallbladder	Gastrectomy, Hofmeister type Anterior, isoperistaltic gastrojejunostomy Cholecystectomy	Alive and well	4 years 4 months
51 (M.C.)	35	F	Melena, cause undetermined	Duodenum	Gallbladder right salpinx	Duodenal diverticulectomy Cholecystectomy Salpingectomy	Alive and well	5 years 6 months
52 (R.C.)	38	F	Duodenal ulcer Chronic cholecystitis Cholelithiasis	Stomach and duodenum	Gallbladder	Gastrectomy, Hofmeister type Duodenectomy with excision of ulcer Anterior, contraperistaltic gastrojejunostomy Cholecystectomy	Alive and well	1 year 6 months
53 (V.D.)	29	M	Duodenal ulcer Cholecystitis	Stomach and duodenum	Gallbladder	Duodenectomy with excision of ulcer Hofmeister gastrectomy—anterior, contraperistaltic gastrojejunostomy Cholecystectomy	Alive and well	1 year 6 months

TABLE 1.—(*Continued*)—*Multiple Resections for Benign Lesions*

Case No.	Age	Sex	Diagnosis	Viscera Resected Primarily	Viscera Resected Concomitantly	Operative Procedure and Method of Reconstruction	Result	Survival Period
54 (R.H.)	48	M	Volvulus of ileum Portal hypertension Congestive splenomegaly	Ileum	Spleen	Resection of ileum—primary end-to-end anastomosis Splenectomy	Died of renal and hepatic failure	48 hours
55 (M.G.)	52	F	Duodenal ulcer Gastric ulcer Chronic cholecystitis Cholelithiasis Fibromyomasta of uterus	Stomach and duodenum	Gallbladder	Duodenectomy with excision of ulcer Gastrectomy with excision of ulcer Hofmeister—anterior contraperistaltic gastrojejunostomy Cholecystectomy	Alive and well	1 year 8 months
56 (N.H)	55	M	Duodenal ulcer Chronic cholecystitis Cholelithiasis	Stomach and duodenum	Gallbladder	Duodenectomy with excision of ulcer Hofmeister gastrectomy Anterior contraperistaltic gastrojejunostomy Cholecystectomy	Alive and well	4 years
57 (R.K.)	41	F	Chronic cholecystitis Cholelithiasis Congestive splenomegaly	Gallbladder	Spleen	Cholecystectomy Splenectomy	Alive and well	3 years 3 months
58 (T.L.)	36	F	Chronic cholecystitis Cholelithiasis Right ovarian cyst	Gallbladder	Ovary	Cholecystectomy Oophorectomy	Alive and well	4 years 6 months
59 (J.L.)	64	F	Duodenal ulcer Chronic cholecystitis Cholelithiasis	Stomach and duodenum	Gallbladder	Hofmeister duodenostomy with excision of ulcer Hofmeister gastrectomy—anterior contraperistaltic gastrojejunostomy Cholecystectomy	Alive and well	3 years 4 months
60 (F.M.)	51	M	Duodenal ulcer Chronic cholecystitis Cholelithiasis	Stomach and duodenum	Gallbladder	Duodenectomy with excision of ulcer Hofmeister gastrectomy—anterior contraperistaltic gastrojejunostomy	Alive and well	1 year
61 (J.R.)	65	M	Duodenal ulcer Chronic cholecystitis	Stomach and duodenum	Gallbladder	Duodenectomy with excision of Ulcer Hofmeister gastrectomy—anterior contraperistaltic gastrojejunostomy Cholecystectomy	Alive and well	1 year
62 (H.S.)	49	F	Duodenal ulcer Chronic cholecystitis Cholelithiasis	Stomach and duodenum	Gallbladder	Duodenectomy with excision of ulcer Gastrectomy Gastroduodenostomy—Billroth No. 1 Cholecystectomy	Alive and well	2 years

TABLE 1.—*(Continued)*—*Multiple Resections for Benign Lesions*

Case No.	Age	Sex	Diagnosis	Viscera Resected Primarily	Viscera Resected Concomitantly	Operative Procedure and Method of Reconstruction	Result	Survival Period
63 (E.T.)	48	F	Duodenal ulcer Chronic cholecystitis Cholelithiasis	Stomach and duodenum	Gallbladder	Duodenectomy with excision of ulcer Hofmeister gastrectomy—anterior contraperistaltic gastrojejunostomy Cholecystectomy	Alive and well	1 year 6 months
64 (C.T.)	34	M	Gastric diverticulum Chronic cholecystitis Cholelithiasis	Stomach	Gallbladder	Gastric diverticulectomy Cholecystectomy	Alive and well	1 year
65 (T.W.)	79	F	Chronic cholecystitis Cholelithiasis Duodenal diverticulum	Gallbladder	Duodenum	Cholecystectomy Choledochotomy Duodenal diverticulectomy	Alive and well	9 months
66 (V.W.)	59	F	Chronic cholecystitis Cholelithiasis Fibroma of duodenum	Gallbladder	Duodenum	Cholecystectomy Duodenectomy to include fibroma	Alive and well	5 years
67 (J.E.)	63	M	Perforating duodenal ulcer involving pancreatic head	Stomach and Duodenum	Common duct Pancreatic duct	Duodenectomy with excision of ulcer Hofmeister gastrectomy—anterior contraperistaltic gastrojejunostomy Choledochocholedochostomy Reimplantation of pancreatic duct into the duodenum	Died of bile perito-nitis	10 weeks
70 (C.M.)	44	F	Large right ovarian cyst Empyema of gallbladder Cholelithiasis	Gallbladder	Right ovary	Cholecystectomy Right oophorectomy	Alive and well	1 year 3 months
72 (M.P.)	40	F	Uterine fibromyomas Chronic cholecystitis Cholelithiasis	Uterus Tubes Ovaries	Gallbladder	Total hysterectomy Bilateral salpingo-oophorectomy Cholecystectomy	Alive and well	5 years
73 (D.L.)	45	F	Uterine fibromyomas Chronic cholecystitis Cholelithiasis with stone impacted in ampulla of gallbladder	Uterus Tubes Ovaries	Gallbladder	Total hysterectomy Bilateral salpingo-oophorectomy Cholecystectomy	Alive and well	4 years 6 months
75 (G.H.)	42	F	Chronic pelvic inflammatory disease Chronic cholecystitis Cholelithiasis	Uterus Tubes	Gallbladder	Total hysterectomy Bilateral salpingo-oophorectomy	Alive and well	3 months

TABLE 1.—(*Continued*)—*Multiple Resections for Benign Lesions*

Case No.	Age	Sex	Diagnosis	Viscera Resected Primarily	Viscera Resected Concomitantly	Operative Procedure and Method of Reconstruction	Result	Survival Period
76 (L.B.)	65	M	Chronic duodenal ulcer with erosion into the pancreatic head and massive hemorrhage	Stomach and duodenum	Common duct Pancreatic duct	Gastrectomy—anterior contraperistaltic gastrojejunostomy Resection of common duct—end-to-side choledochoduodenostomy Resection of pancreatic duct—end-to-end anastomosis	Alive and well	5 years
80 (V.T.)	49	M	Duodenal ulcer with obstruction Chronic cholecystitis Cholelithiasis	Stomach and duodenum	Gallbladder	Hofmeister gastrectomy—anterior contraperistaltic gastrojejunostomy Cholecystectomy	Alive and well	4 years

entities at the primary operative intervention. Thus, it has not been thought unwise to superimpose cholecystectomy upon total hysterectomy where calculus impacted in the cystic duct seemingly had already prepared the swollen and distended gallbladder for progressive inflammatory change. Similarly, cholecystectomy has been added to gastrectomy, oophorectomy and colectomy. Ileectomy and jejunectomy have been necessary in the management of intestinal fistulas of various origins. The common and pancreatic ducts also have been resected and reconstructed in cases of stenosing choledochal and pancreatic inflammation incident to long-standing duodenal ulceration. Additional benign entities have been eliminated simultaneously, as set forth in Table 1.

Age and Sex Incidence.—The average age of 30 patients requiring multiple resections for benign intra-abdominal lesions was 49 years. Twelve were men and 18 were women.

Operative Mortality and Cause of Death.—The death of any patient succumbing within the first three weeks was considered an operative death. The mortality rate was 6.6 per cent. One patient died of bile peritonitis following gastric and pancreatic resection. Another, with severe portal hypertension incident to cirrhosis, died of progressive hepatic and renal failure following massive resection of gangrenous ileum and splenectomy.

Survival Rate.—Twenty-eight of 30 patients are alive, well and rehabilitated, with an average survival period of three years at the time of writing. It may be reasonably assumed that these 28 survivors who underwent multiple resections for benign disease will not ultimately die of the lesions for which surgical treatment was instituted.

MULTIPLE RESECTIONS FOR MALIGNANT LESIONS

In the light of our limited knowledge of malignant disease, total ablation of an abdominal cancer can be achieved only by radical removal of the viscus in which

TABLE 2.—*Summary of Results*

	No. of Cases	Average Age	Immediate Mortality	Average Survival
Benign Men.....12 Women.....18	30	49	6.6% (2 operative deaths)	93.4% (28 alive and well 3 years)
Malignant Men.....19 Women.....31	50	58	18.0% (9 operative deaths)	82.0% (16 survived less than 1 year; 25 alive and well 33 months)
Total cases....	80	54	13.7%	86.3%

the tumor originates, together with the gland-bearing area of that viscus. Surgical intervention that falls short of this goal is, indeed, homeopathic. The problem presented by the 50 patients with malignant disease who came under our care consisted not only of complete removal of the viscus harboring the primary tumor but of all other viscera or portions of viscera to which it had extended, either by direct contiguity or via the nodal route. A survey of the survival rate (Table 2) reveals that rigid adherence to the tenets of radicalism in the management of malignant disease has salvaged an appreciable number of persons who might otherwise have been relegated to the pitiable category of hopeless inoperability. Of these, the majority are leading useful, vigorous lives. Even those who succumbed later of recurrence seemed to have obtained temporary benefit. Accordingly, resection, complete or partial, of from two to seven viscera has been attempted in the endeavor to prolong life or to save it. We have not hesitated to sacrifice the kidney and ureter, a portion of the inferior vena cava and the common iliac vein, stomach, duodenum, gallbladder and a portion of the liver, massive areas of the abdominal wall, prostate gland, ductus deferens, uterus, tubes, ovaries and the vagina in the eradication of malignant neoplasms originating in the large bowel. Sacrifice of the ileum, the jejunum and a part of the pancreas has been necessary when uterine fibrosarcoma was encountered. Other viscera or portions of viscera necessitating resection to effect total eradication of a primary neoplastic process are listed in Table 3.

Age and Sex Incidence.—Of the 50 patients with malignant disease of the abdomen, 19 were men and 31 were women. The average age was 58 years.

Operative Mortality and Cause of Death.—Again, the death of any patient dying within the first three postoperative weeks was considered an operative death. Nine patients fell into this category, making an immediate mortality rate of 18 per cent. When one considers the magnitude of the issues requiring extensive intraabdominal manipulation with its inevitably attendant trauma, the profound physiologic disturbances occurring concomitantly and the goal to be attained, it seems plausible to regard this rate as not excessive. By unremitting effort directed to the early recognition and evaluation of the malignancy and adequate attention to preoperative, operative and postoperative details, it is hoped that this may be materially reduced.

Of the 9 postoperative victims, 1 died of pulmonary embolism, 2 of progressive renal failure, 2 of the catastrophic complication of bile peritonitis, 1 of fulminating bacterial peritonitis, and 1 of thoracic empyema; the death of 1 was directly attributable to the anesthetic.

Survival Rate.—Of these 50 patients with advanced abdominal cancer, 25 are alive and well at the time of writing.

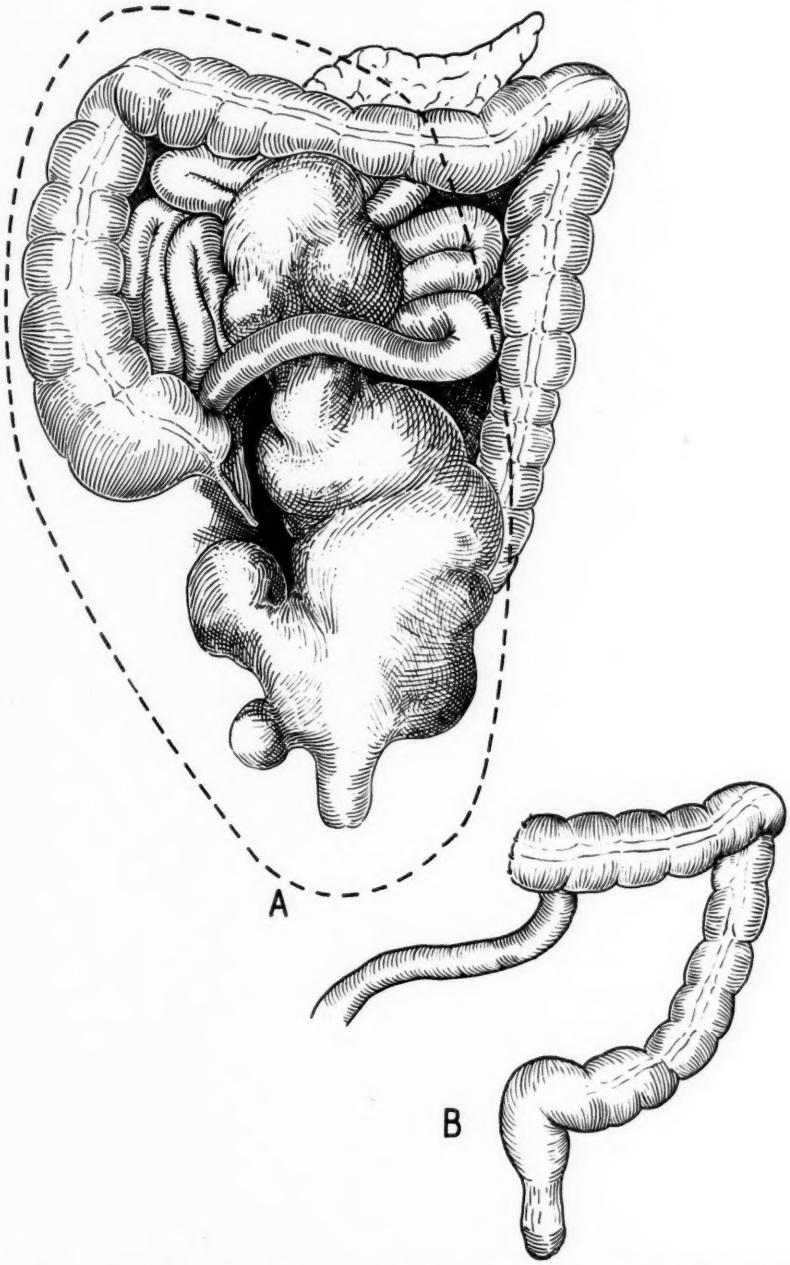

Fig. 5 (*Case 29*).—D.G. Sarcoma of the uterus involving small bowel with retroperitoneal extension into the body of the pancreas. *A*, Viscera resected (uterus and appendages, distal small bowel and right half of colon). *B*, method of reconstruction. Single one-stage procedure.

TABLE 3.—*Multiple Resections for Malignant Lesions*

Case No.	Age	Sex	Diagnosis	Viscera Resected Primarily	Viscera Resected Concomitantly	Operative Procedure and Method of Reconstruction	Result	Surviva Period
1(M.M.)	53	F	Carcinoma of sigmoid colon; chronic cholecystitis; cholelithiasis	Sigmoid colon	Gallbladder	Resection of sigmoid colon—primary end-to-end anastomosis Cholecystectomy	Alive and well	8 months
2 (E.N.)	67	F	Carcinoma of descending colon with mesenteric noda involvement and extension to left ureter	Left half of transverse colon, descending colon and sigmoid colon	Left kidney Left ureter	Resection of left colon—primary end-to-end anastomosis of transverse colon and rectum	Died of recurrence	1 year
3 (I.P.)	58	F	Neurofibrosarcoma of celiac plexus; large gastric ulcer	Celiac plexus	Stomach	Excision of tumor mass Gastrectomy—gastroduodenostomy	Alive and well	8 months
4 (B.P.)	26	F	Colloid carcinoma of rectum with metastasis to vaginal wall	Sigmoid, rectum and anus	Posterior vaginal wall	Abdominoperineal resection Resection of posterior vaginal wall	Alive and well	1 year
5 (O.R.)	50	M	Carcinoma of stomach with metastasis to transverse mesocolon nodes	Stomach	Hepatic flexure of colon	Gastric resection—anterior gastrojejunostomy Resection of hepatic flexure of colon—end-to-end anastomosis of right colon	Alive and well	7 months
6 (J.S.)	51	M	Carcinoma of cecum with metastasis to abdominal wall	Right colon	Right lower abdominal wall quadrant	Right hemicolectomy—primary ileotransverse colostomy Resection of right lower abdominal wall	Alive and well	6 months
7 (O.Z.)	67	M	Carcinoma of ascending colon with metastasis to abdominal wall	Right colon	Right lower abdominal wall quadrant	Right hemicolectomy—primary ileotransverse colostomy Resection of right lower abdominal wall	Alive and well	2 years
8(M.W.)	76	F	Carcinoma of pancreas with duodenal invasion	Pancreas	Stomach Duodenum	Total pancreatectomy Duodenectomy Gastric resection—anterior contraperistaltic gastrojejunostomy Choledochojejunostomy	Died of recurrence	7 months
9 (E.S.)	61	F	Carcinoma of rectum with metastasis to liver	Sigmoid rectum and anus	Liver Gallbladder	Abdominoperineal resection Partial hepatectomy Cholecystectomy	Died of hepatic metastasis	1 year

TABLE 3. (*Continued*)—*Multiple Resections for Malignant Lesions*

Case No.	Age	Sex	Diagnosis	Viscera Resected Primarily	Viscera Resected Concomitantly	Operative Procedure and Method of Reconstruction	Result	Survival Period
10 (E.R.)	64	M	Carcinoma of rectum with invasion of seminal vesicle	Anus, rectum Sigmoid colon	Right ductus deferens and seminal vesicle	Abdominoperineal resection Resection of right ductus deferens and right seminal vesicle	Died of massive pulmonary embolism	5 days
11 (H.R.)	74	M	Carcinoma of stomach with metastasis to body of pancreas	Stomach	Body of pancreas	Gastrectomy—anterior gastrojejunostomy Partial pancreatectomy	Alive and well	4 years 9 months
12 (G.M.)	78	M	Carcinoma of sigmoid colon; metastasis to distal ileum	Sigmoid colon	Ileum	Obstructive resection of sigmoid colon Resection and primary end-to-end anastomosis of ileum	Alive and well	1 year 11 months
13 (B.L.)	37	F	Recurrent carcinoma of sigmoid colon with metastasis to vagina and anterior abdominal wall	Sigmoid colon	Vagina Abdominal wall	Resection of sigmoid colon and primary end-to-end anastomosis Resection of superior vagina Resection of abdominal wall	Alive and well	1 year 6 months
14 (T.B.)	50	M	Carcinoma of sigmoid colon with metastasis to urinary bladder and ileum	Sigmoid colon	Urinary bladder and ileum	Resection of sigmoid colon and primary end-to-end anastomosis Partial cystectomy Resection of ileum—primary end-to-end anastomosis	Alive and well	1 year 9 months
16 (J.P.)	63	F	Carcinoma of sigmoid colon with metastasis to liver	Sigmoid colon	Liver Gallbladder	Resection of sigmoid colon and primary end-to-end anastomosis Partial hepatectomy Cholecystectomy	Died of bilateral pyelo-nephritis	1 year 3 months
17 (E.P.)	42	M	Multiple polyposis of colon Carcinoma of sigmoid colon with metastasis to left ductus deferens	Colon, rectum and anus	Ductus deferens	Total colectomy Abdominoperineal resection Permanent ileostomy Resection of ductus deferens	Alive and well	2 years 3 months
18 (L.R.)	75	F	Carcinoma of rectum Stenosing diverticulitis of sigmoid colon	Rectum and anus	Descending colon	Left colectomy Abdominoperineal resection	Alive and well	8 months
19 (J.S.)	57	M	Carcinoma of stomach with metastasis to body of pancreas	Stomach	Pancreas	Gastrectomy Partial pancreatectomy	Alive and well	10 years

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TABLE 3. *(Continued)—Multiple Resections for Malignant Lesions*

Case No.	Age	Sex	Diagnosis	Viscera Resected Primarily	Viscera Resected Concomitantly	Operative Procedure and Method of Reconstruction	Result	Survival Period
20 (B.P.)	76	F	Carcinoma of transverse colon with local metastasis and widespread mesenteric and hepatic metastasis	Ileum and right colon	Right colon Stomach and duodenum Liver and gallbladder Anterior abdominal wall	Resection of ileum and right and left colons ileosigmoidostomy Duodenectomy and gastric resection—gastrojejunostomy Resection of liver Cholecystectomy Resection of anterior abdominal wall	Died of widespread metastasis	9 months
21 (P.K.)	66	F	Carcinoma of rectum with metastasis to ileum	Anus, rectum Sigmoid colon	Ileum	Abdominoperineal resection Resection of ileum and primary end-to-end anastomosis	Died of recurrence	10 months
22 (L.O.)	50	F	Linitis plastica of stomach with metastasis to transverse colon and mesocolon	Stomach	Spleen Transverse colon	Total gastrectomy—gastroesophagostomy Splenectomy Transverse colectomy—primary end-to-end anastomosis	Died of recurrence	4 months
23 (H.H.)	58	M	Carcinoma of transverse colon with metastasis to ileum	Right colon	Ileum	Right hemicolectomy—primary ileotransverse colostomy Massive resection of ileum—ileoileostomy	Died of recurrence	6 months
24 (R.W.)	38	F	Regional ileocolitis Carcinoma of rectum with rectovaginal fistula	Sigmoid, rectum and anus	Ileum Right colon Vagina	Abdominoperineal resection Right hemicolectomy and resection of 6 feet of ileum—end-to-side ileotransverse colostomy Resection of posterior vaginal wall	Alive and well	1 year 3 months
25 (J.D.)	70	F	Carcinoma of rectum with direct extension metastasis to right common iliac vein	Anus, rectum and sigmoid colon	Right common iliac vein	Abdominoperineal resection Resection of right common iliac vein	Alive and well	2 years 2 months
26 (E.M.)	67	F	Carcinoma of sigmoid colon with direct extension metastasis to ileum Multiple uterine fibromyomas	Sigmoid colon	Ileum Uterus Tubes and ovaries	Resection of sigmoid colon—primary end-to-end anastomosis Resection of ileum—primary end-to-end anastomosis Supracervical hysterectomy and bilateral salpingo-oophorectomy	Alive and well	5 years
27 (G.K.)	45	M	Sarcoma arising from small intestine	Ileum and jejunum	Abdominal wall	Resection of Ileum—primary end-to-end anastomosis Resection of jejunum—primary end-to-end anastomosis Resection of right lower abdominal wall	Died of disseminated recurrence	3 years 6 months

TABLE 3. (*Continued*)—*Multiple Resections for Malignant Lesions*

Case No.	Age	Sex	Diagnosis	Viscera Resected Primarily	Viscera Resected Concomitantly	Operative Procedure and Method of Reconstruction	Result	Survival Period
29 (D.G.)	63	F	Sarcoma of uterus with direct extension metastasis to distal ileum, cecum, ascending colon and pancreas	Uterus Tubes and ovaries	Distal ileum Right colon Pancreas	Total hysterectomy Bilateral salpingo-oophorectomy Resection of distal ileum and right colon; primary end-to-side ileotransverse colostomy Partial pancreatectomy	Alive and well	10 months
30 (M.D.)	67	F	Carcinoma of stomach with invasion of right lobe of liver Cholecystogastric	Stomach	Liver Gallbladder	Gastrectomy—gastroduodenostomy Partial hepatectomy Cholecystectomy	Died of uremia	8 days
31 (A.F.)	40	F	Carcimona of stomach with invasion of pancreas	Stomach	Pancreas Spleen	Total gastrectomy—esophagojejunostomy Partial pancreatectomy Splenectomy	Died of recurrence	6 months
32 (E.C.)	51	M	Carcinoma of duodenum with pancreatic and transverse mesocolon invasion	Duodenum	Stomach Pancreas Common duct Transverse colon	Gastrectomy—Gastroduodenostomy Resection of pancreas and common duct—cholecystogastrostomy Obstructive resection of transverse colon	Died of bile peritonitis	9 days
33 (J.C.)	69	M	Carcinoma of cardia of stomach invading Tail of pancreas and extending into spleen Empyema of gallbladder	Stomach	Pancreas Spleen	Gastrectomy (95%)—gastroesophagostomy Partial pancreatectomy Splenectomy Cholecystostomy	Died of left pleural empyema	10 days
35 (C.A.)	67	M	Carcinoma of stomach with invasion of transverse colon	Stomach	Transverse colon	Gastrectomy—gastrojejunostomy Obstructive resection of transverse colon	Died of bacterial peritonitis	3 weeks
36 (M.R.)	60	F	Carcinoma of hepatic flexure of colon with invasion of right kidney, right renal vein and vena cava	Right colon	Right kidney Inferior vena cava wall	Right hemicolectomy—primary end-to-side ileotransverse colostomy Right nephrectomy Resection (elliptic) of inferior vena cava	Died of renal failure	5 days
37 (H.R.)	69	F	Carcinoma of gallbladder invading liver and duodenum	Gallbladder	Liver Duodenum Stomach	Cholecystectomy Partial hepatectomy Gastrectomy and duodenectomy—gastroduodenostomy	Died of recurrence	5 months

TABLE 3. *(Continued)—Multiple Resections for Malignant Lesions*

Case No.	Age	Sex	Diagnosis	Viscera Resected Primarily	Viscera Resected Concomitantly	Operative Procedure and Method of Reconstruction	Result	Survival Period
38 (S.M.)	72	F	Carcinoma of stomach invading body of pancreas	Stomach	Pancreas	Gastrectomy—gastroduodenostomy Partial pancreatectomy	Alive and well	1 year
39 (J.D.)	60	M	Carcinoma of rectum with metastasis to prostate and seminal vesicles	Anus, rectum, sigmoid colon	Prostate Seminal vesicles	Abdominoperineal resection Prostatectomy Resection of seminal vesicles	Dien anesthetic death	1 hour
40 (L.D.)	41	F	Carcinoma of rectum with metastasis to vagina Diabetes mellitus Gangrene of left foot	Anus, rectum, sigmoid colon	Vagina Left lower extremity	Abdominoperineal resection Resection of posterior vaginal septum Midthigh amputation of left lower extremity	Died of recurrence	3 years
41 (K.G.)	37	F	Carcinoma of stomach with wide nodal involvement and direct extension into liver	Stomach	Liver	Gastrectomy—gastrojejunostomy Resection of liver	Died of recurrence	6 months
45 (L.K.)	74	F	Carcinoma of distal end of common bile duct	Common bile duct	Duodenum Stomach Pancreas	Gastrectomy and duodenectomy—retrocolic, contraperistaltic gastrojejunostomy Resection of common bile duct—choledochoduodenostomy Resection of pancreas—pancreatocholedochostomy	Died of hepatitis	1 month
46 (A.L.)	63	F	Carcinoma of stomach with direct extension metastasis to pancreas	Stomach	Pancreas Spleen	Total gastrectomy—esophagoduodenostomy Partial pancreatectomy Splenectomy	Died of recurrence	4 months
47 (J.M.)	54	M	Carcinoma of rectum with direct extension metastasis to prostate	Anus, rectum, sigmoid colon	Prostate	Abdominoperineal resection Prostatectomy	Alive and well	1 year 3 months
48 (H.L.)	34	M	Carcinoma of duodenal papilla with metastasis to mesenteric and pancreatic nodes	Duodenum	Stomach Pancreas and common bile duct	Duodenectomy and gastrectomy—anterior gastrojejunostomy Partial pancreatectomy—pancreatoduodenostomy Resection of common bile duct—cholecystoduodenostomy	Died of bile peritonitis	14 days
49 (S.P.)	66	M	Carcinoma of rectum with direct extension to prostate	Sigmoid colon, rectum, anus	Prostate	Abdominoperineal resection Partial prostatectomy	Alive and well	1 year

TABLE 3. (*Continued*)—*Multiple Resections for Malignant Lesions*

Case No.	Age	Sex	Diagnosis	Viscera Resected Primarily	Viscera Resected Concomitantly	Operative Procedure and Method of Construction	Result	Survival Period
68 (O.W.)	44	F	Carcinoma of sigmoid colon with extension to abdominal wall and ileum Carcinoma of cecum Carcinoma of ileum with extension to abdominal wall	Sigmoid colon Right colon Ileum	Two segments of anterior abdominal wall	Obstructive resection of sigmoid colon and resection of anterior abdominal wall Resection of ileum—primary end-to-end anastomosis Right hemicolectomy—primary end-to-side eleotransverse colostomy Resection of ileum and abdominal wall—end-to-end anastomosis	Alive and well	12 years 3 months
69 (K.M.)	52	F	Carcinoma of sigmoid colon Primary carcinoma of ileum Extension on carcinoma of cervical stump, omentum and abdominal wall	Sigmoid colon Ileum	Cervical stump Upper vagina Omentum Abdominal wall nodule	Resection of sigmoid colon—primary end-to-end anastomosis Resection of ileum—primary end-to-end anastomosis Resection of cervical stump and upper vagina Resection of omentum and abdominal wall nodule	Alive and well	7 years 3 months
71 (E.P.)	27	F	Carcinoma of rectum with extension Metastasis to pelvic viscera Multiple polyposis of colon	Sigmoid colon Anus and rectum	Right and left colon Vagina Uterus Tubes and ovaries	Abdominoperineal resection Resection of posterior vaginal wall Total colectomy—permanent ileostomy with skin graft to ileostomy Total hysterectomy Bilateral salpingo-oophorectomy	Alive and well	6 months
74 (H.R.)	73	F	Carcinoma of uterus (adenocarcinoma of corpus) with direct extension metastasis to urinary bladder, urogenital diaphragm and vagina	Uterus, tubes and ovaries	Vagina Bladder Urogenital diaphragm Labia minora and majora	Total hysterectomy and bilateral salpingo-oophorectomy Resection of vagina and labia Total cystectomy and resection of distal ureters with ileotransverse colostomy and implantation of ureters into distal ileum	Died of renal failure	12 days
77 (I.S.)	48	F	Carcinoma of right breast with metastasis to thoracolumbar vertebrae and lungs Adenocarcinoma of left ovary with extension to and obstruction of sigmoid colon Carcinoma of left breast	Right breast destroyed elsewhere (cancer paste) Tubes, ovaries and uterus	Sigmoid colon Left breast	Total hysterectomy and bilateral salpingo-oophorectomy Resection of sigmoid colon—permanent colostomy Left radical mammectomy Massive deep roentgen therapy	Alive and well	6 years

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TABLE 3. *(Continued)—Multiple Resections for Malignant Lesions*

Case No.	Age	Sex	Diagnosis	Viscera Resected Primarily	Viscera Resected Concomitantly	Operative Procedure and Method of Reconstruction	Result	Survival Period
78 (M.G.)	78	F	Carcinoma of gallbladder with metastasis to liver Cholelithiasis	Gallbladder	Liver	Cholecystectomy Resection of liver	Died of recurrence	5 months
79 (W.M.)	53	M	Adenocarcinoma of rectum Adenocarcinoma of sigmoid colon Adenocarcinoma of hepatic flexure of colon	Rectum Sigmoid	Right half of colon Distal ileum	Resection of rectum and sigmoid colon with primary end-to-end anastomosis Right hemicolectomy—primary end-to-side ileotransverse colostomy	Alive and well	6 months

Their average survival period is thirty-three months. The average survival period of the 16 patients who died of recurrence or persistence of their original malignant disease was one year.

SUMMARY

Eighty patients requiring multiple visceral resections were studied. Thirty had had two or more viscera removed for benign lesions, with an operative mortality of 6.6 per cent. Twenty-eight of these have survived for an average period of three years.

Fifty patients with advanced abdominal malignant disease required the removal of two to seven viscera or portions of viscera in the attempted eradication of their disease. Nine died within the first three weeks, constituting an operative mortality rate of 18 per cent. Sixteen patients died of recurrence of malignant disease after an average period of one year. The remaining 25 are alive and well, with an average survival period of thirty-three months.

CONCLUSIONS

The patient with extensive and advanced abdominal malignant disease must accept the proportionately greater operative hazard involved in radical attempts toward complete removal of the neoplasm. The surgeon must also face this unflinchingly. If he does, his "crutch" of inoperability will be leaned upon less frequently, and his reward will be an ever-increasing aggregate of patients whom he has helped to guide from the umbra of despair.

RÉSUMÉ ET CONCLUSIONS

On rapporte ici 80 cas de résections multiples de viscères. De ce nombre, 30 patients eurent deux organes ou plus de réséqués pour des lésions bénignes avec un taux de mortalité opératoire de 6.6%. 28 cas ont survécu 3 ans. 50 patients qui présentaient des lésions malignes très avancées eurent entre deux et sept viscères d'enlevés. Il y eut 9 mortalités durant les 3 premières semaines, donnant

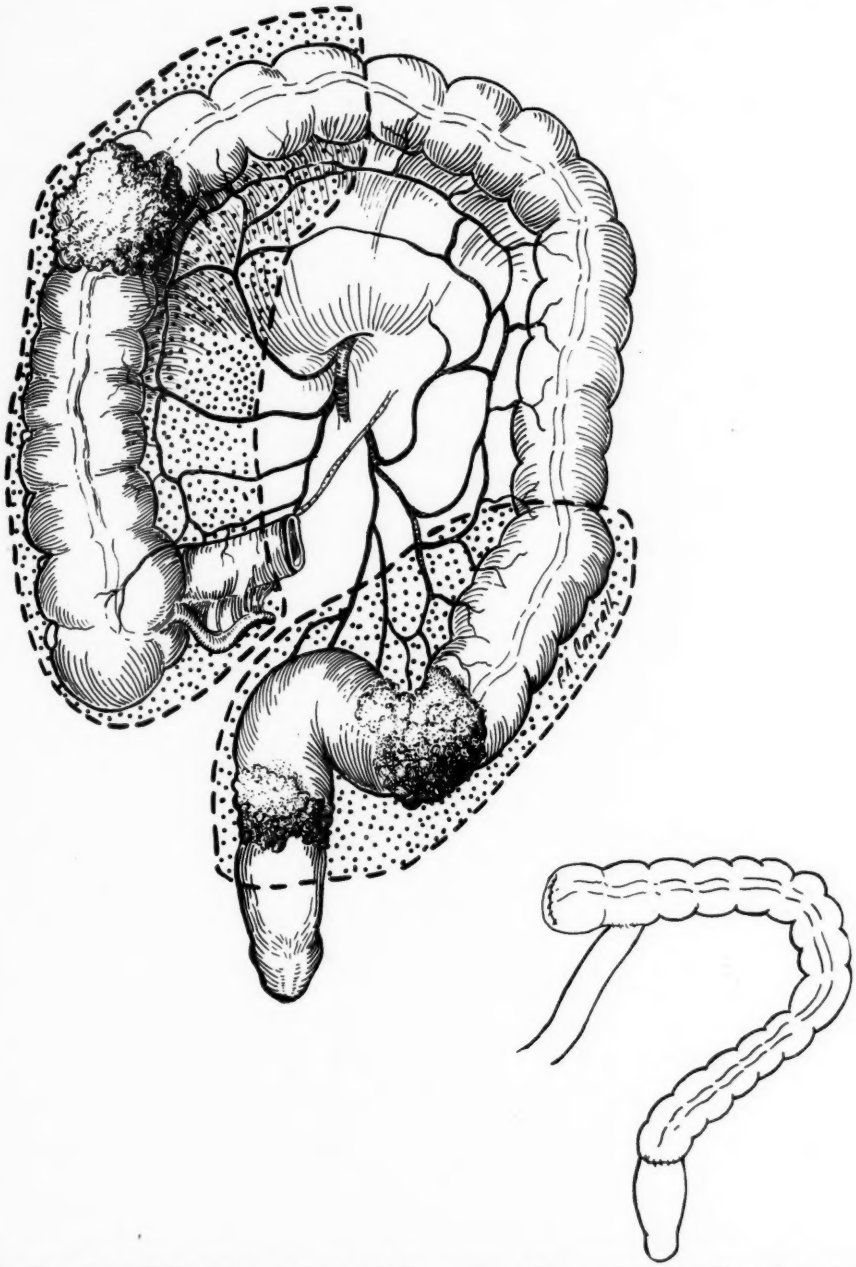

Fig. 6 (*Case 79*).—W.M. Adenocarcinoma of the rectum, adenocarcinoma of the colon, adenocarcinoma of the hepatic flexure of the colon—three primary lesions—occurring in the same patient and discovered at operation. Dotted lines indicate viscera resected. Right hemicolectomy, resection of the sigmoid colon and rectum. Ileotransverse colostomy and primary end-to-end anastomosis of descending colon and rectum. Single one-stage procedure.

alors un taux de mortalité de 18%. Il y eut 16 autres décès par récidive après une année. Les 25 autres vivent encore et se portent bien, donnant ainsi une moyenne de survie de 33 mois.

Les patients qui présentent une atteinte cancéreuse abdominale avancée présentent aussi un risque opératoire plus grand, si le chirurgien envisage l'éradication complète de la néoplasie. Le chirurgien ne doit pas flancher en face de cette obligation.

RESUMEN Y CONCLUSIONES

Se estudian 80 pacientes que requirieron resecciones viscerales múltiples. En 30 se extirparon dos o más vísceras por lesiones benignas, con mortalidad de 6.6%, habiendo sobrevivido 28 de estos un promedio de 3 años. En 50 pacientes con lesiones malignas abdominales avanzadas se extirparon de dos a siete vísceras o porciones de víscera en al intento de erradicar su enfermedad, habiendo muerto 9 en las primeras tres semanas, con mortalidad operatoria del 18%, y 16 por recidiva después de 1 año aproximadamente. Los 25 restantes se encuentran vivos y bien, con un promedio de supervivencia de 33 meses.

RIASSUNTO E CONCLUSIONI

Ottanta pazienti richiedendo risezioni multipli viscerale furono studiati. Trenta hanno avuto rimosso due o piu' viscere a causa di lesioni benigni, con martalita' di 6.6 percento. Ventotto di questi hanno sopravissuto un termine di tre anni. Cinquanta pazienti con malattia addominale maligna avanzata avevano bisogno di rimovimento da due a sette viscere o porzioni di viscere nel attantato sradicamento di loro malattia. Nove morirono dentro dei primi tre settimane, costituendo un rango di mortalita' operatoria di 18 per cento. Sedici pazienti morirono di recidivo della malattia maligna dopo un periodo termine di un anno. I rimanente 25 sono vivente e bene, con sopravvivenza di trentatre mesi.

ZUSAMMENFASSUNG UND SCHLUSSFOLGERUNGEN

Achtzig Patienten, bei denen mehrfache Organresektionen noetig waren, wurden untersucht. An dreissig von diesen waren zwei oder mehr Organe wegen gutartiger Erkrankungen vorgenommen worden, und die Operationssterblichkeit betrug 6,6%. Achtundzwanzig von diesen sind nach durchschnittlich drei Jahren noch am Leben. Bei fuenfzig Kranken mit vorgeschrittenen boesartigen Baucherkrankungen erforderte der Versuch, das Leiden auszurotten, die Entfernung von zwei bis sieben Organen oder Organteilen. Neun Kranke starben innnerhalb der ersten drei Wochen und brachten die Operationssterblichkeit auf eine Quote von 18%. Sechzehn Kranke starben innerhalb durchschnittlich eines Jahres an einen Rueckfall der boesartigen Erkrankung. Die uebrigen fuenfundzwanzig sind nach durchschnittlich etwa dreiunddreissig Monaten wohlauf. Kranke mit augsgedehnten und vorgeschrittenen boesartigen Bauchleiden muessen ein durch den radikalem Versuch einer vollstaendigen Entfernung der Geschwulst bedingtes verhaeltnismaessig groesseres Operationsrisiko auf sich nehmen. Auch der Chirurg muss dieser Tatsache unerschrocken ins Auge sehen.

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The Diagnosis and Surgical Treatment of Cervical Lesions of the Intervertebral Disc

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PAIN in the shoulder and arm occurs with considerable frequency and may attain a distressing significance. In the past this common syndrome was erroneously ascribed to brachial neuritis, cervical rib, scalenus anticus syndrome, arthritis, bursitis, myositis, fibrosis and other conditions. Since its actual pathologic background was poorly understood, the differential diagnosis was in a state of confusion.

In recent years, however, surgeons have come to realize that the most common cause of pain in the shoulder and arm is irritation of a cervical nerve root by a lesion of the intervertebral disc. Some other conditions do occur, but careful consideration of the underlying pathologic disturbance should aid in making a proper diagnosis. Professional knowledge of cervical lesions of the intervertebral disc has been built upon experience gained from correlating clinical signs and symptoms with operative observations and by studying the effects of surgical intervention.

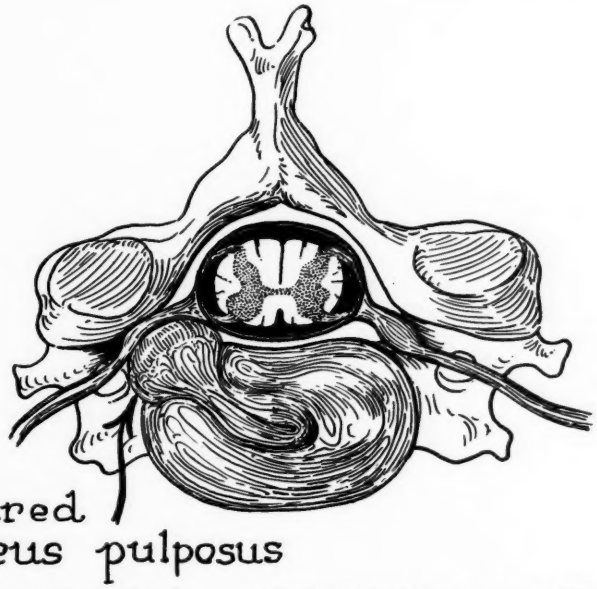

Fig. 1.—Nerve root compression by a ruptured intervertebral disc is shown. On the opposite side the normal relationship of the nerve root is illustrated. (Redrawn after Spurling.)

Interest in the significance of intervertebral disc lesions in the lumbar region was stimulated by a paper by Mixter and Barr[1] in 1933. In succeeding years it gradually became known that the most common cause of low back pain and sciatic

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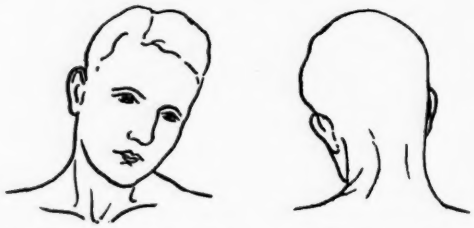

Fig. 2.—Sketch drawn from a patient with painful limitation of motion and a list caused by marked compression of a cervical nerve root.

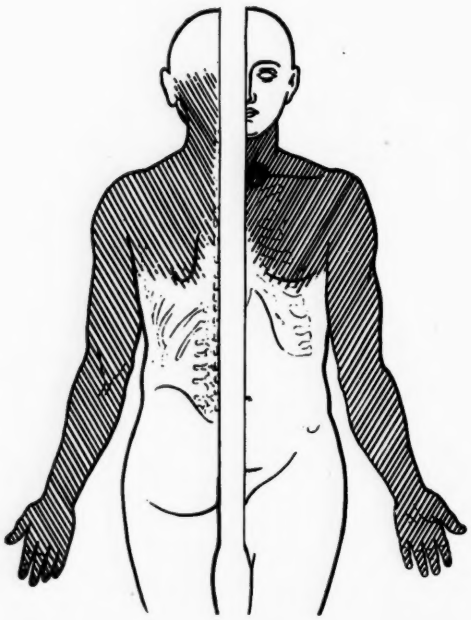

Fig. 3.—Sketch showing entire region (shaded area) where pain may occur from a cervical nerve root lesion. The small circle marks the place where tenderness is often located.

pain was a lesion of an intervertebral disc in the lumbar region. The various types of pathologic lesions of the lumbar discs and the manner in which they produce pain are now well known.

That entirely analogous lesions occur in the cervical region with perhaps equal frequency and also cause distressing pain has come to be known somewhat recently. That it took so many years for this truth to be appreciated is, to say the least, embarrassing. Nowadays, with hindsight on our side, we can look back with chagrin because we did not deduce long before what now appears entirely logical. Even though some of us have been enlightened, we are experiencing again the slow dissemination and slow acceptance of medical progress.

Since the disorder is a very common one and also one in which the symptoms have been for so long erroneously ascribed to various other causes, it seemed fitting to examine this timely subject. Treatment of these disorders has been vastly improved as a result of better understanding of the problem.

As the cervical nerve root leaves the spinal canal, it passes between the disc and the adjacent articular process. It is here that the nerve root is crowded and is frequently subjected to physical irritation by minor changes in structure. This space constitutes the anteroposterior diameter of the intervertebral foramen, and, even in the normal structure, it is scarcely larger than the diameter of the nerve root. When disc material becomes extruded into this space or when hypertrophic marginal disc changes develop the nerve root becomes crowded and occasionally tightly compressed.

A large protrusion may also encroach upon the spinal cord and cause paralysis. Since the neurologic manifestations of spinal cord involvement are apparent, there is little difficulty in recognizing the nature of this disorder. This more serious form of cervical disc protrusion will not be considered further in this presentation.

The common pathologic changes affecting the intervertebral discs are well known, and, by deduction, conclusions have been reached as to how these changes come about. A fair understanding of the mechanism by which the symptoms and objective observations are produced has also been gained.

It seems likely that the common pathologic changes occurring in the intervertebral discs result from injury to the discs,

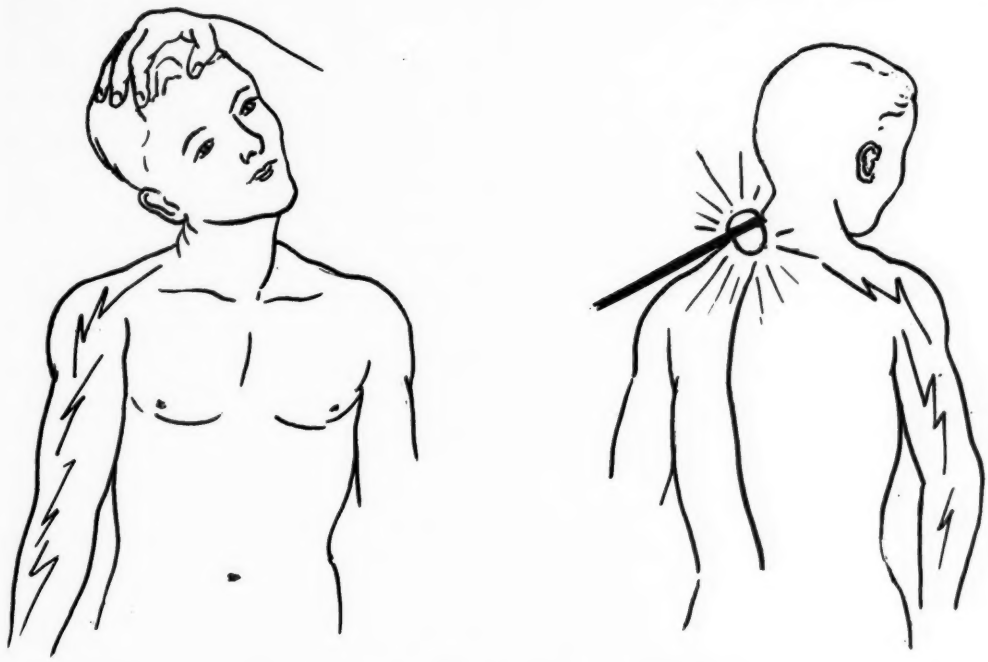

Fig. 4.—Pain or paresthesias may be reproduced by the head compression test or by percussion over the spine. (Redrawn after Spurling.)

either by direct violence or by damage incident to wear and tear, but metabolic or hormonal disturbances or other dysfunctions may play a part in rendering the disc more susceptible to injury. That the disc is initially torn so that its integrity as a supporting and joining structure is disrupted appears probable. Increased mobility between the two adjacent vertebrae results, placing added strain on the intact supporting tissues in the region. This disturbance is probably responsible for the local pain and tenderness in the neck, which tends to diminish as the tissues recover from the initial injury and the reparative processes add support to the injured region.

The nerve root pain results from direct irritation, is characteristically referred to the scapular and shoulder regions and may extend into the arm and distally.

The diagnosis of nerve root compression by a lesion of the intervertebral disc is not difficult, because the location of the pain in the shoulder and the manner in which it is described are nearly always the same. The pain is often aggravated by movements of the neck and arm.

There is often no history of injury. When an injury has occurred, it has usually caused a sudden jerking of the neck. Automobile collisions involving sudden starts or stops often jerk the neck and cause such an injury.

Hypertrophic changes about the disc can exist without causing any symptoms until some relatively minor jerk on the neck initiates acute pain.

If numbness or paresthesia occurs in certain fingers, the diagnosis is almost certain. Spurling[2] has pointed out that pain and paresthesias may often be reproduced by compression of the head onto the neck with the head tilted. The location

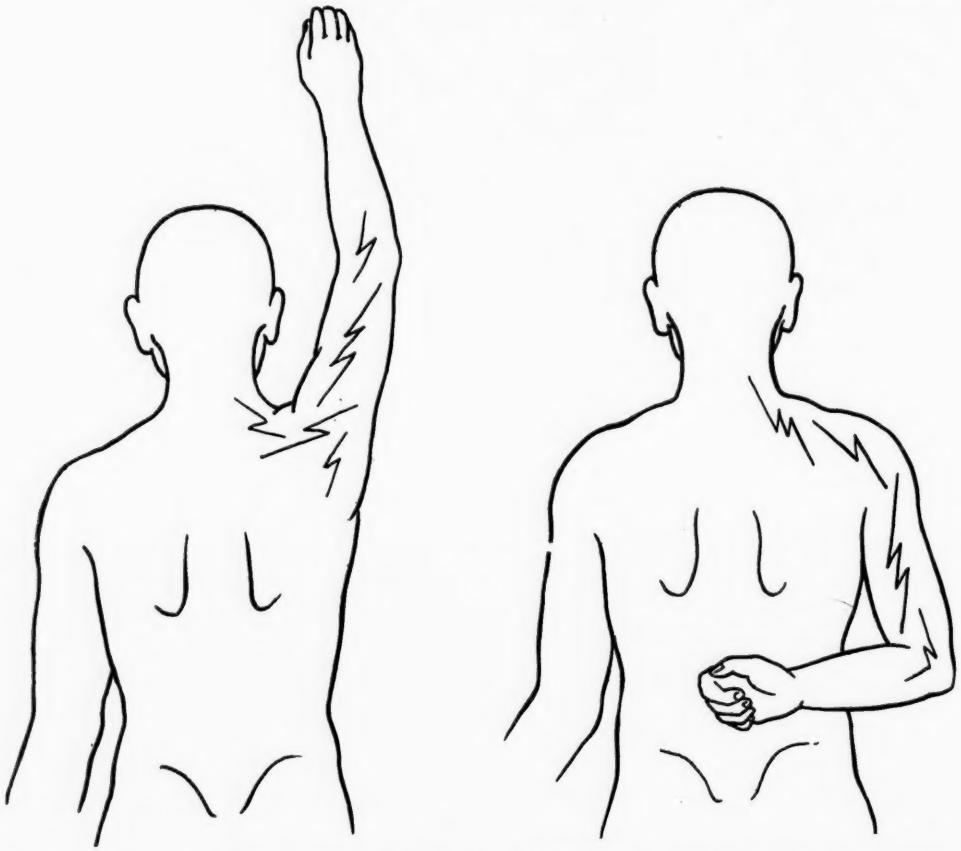

Fig. 5.—Pain or paresthesias may also be reproduced by certain positions of the extremity as illustrated.

of any numbness or paresthesia aids in determining which root is affected. In general, the sixth cervical root innervates the thumb; the seventh, the forefinger and the middle finger; and the eighth, the ring finger and the little finger. Reflex alterations, which add a clue to the localization, may also be noted. The biceps reflex may be diminished or absent when the sixth nerve root is damaged, and the triceps reflex may be altered in a lesion of the seventh nerve root.

Roentgenograms of the cervical portion of the spine are sometimes helpful, but they may appear entirely normal. The abnormalities most frequently observed are diminution of the normal cervical lordosis and narrowing of the disc space. When the lesion is of long standing, hypertrophic marginal changes may be seen. These are the changes which have been noted so frequently in roentgenograms of the spine and which have been referred to so commonly as "osteoarthritis." Views taken obliquely through the long axis of the intervertebral foramen may show encroachment into it by hypertrophic changes of the disc.

Cervical myelographic study may be very helpful, but this procedure has dis-

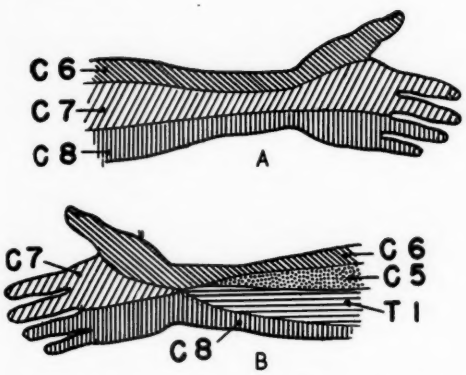

Fig. 6.—Sensory chart showing dermatones. (Redrawn after Keegan.[5])

Fig. 7.—The biceps reflex is often absent or diminished in a lesion of the sixth cervical root while the triceps reflex may be altered in a lesion of the seventh cervical nerve root.

advantages and should be used only when a localized diagnosis cannot be made by other means.

Initial treatment should be conservative, since the pain usually subsides within a few days. Though cervical traction may be helpful, it is often disappointing and may even increase the pain. Immobilization of both the arm and the neck is important. Symptomatic relief of pain may be obtained by analgesics and heat therapy. Any form of manipulative treatment may increase the pain and is potentially dangerous.

If the pain is severe and prolonged, surgical intervention may be required to relieve it. The operative technic has been greatly simplified of late, and the procedure has now come to be a relatively easy one. The laminae are exposed; a dental drill is used to remove the bone over the nerve root, and any disc material which is crowding the root is removed. In certain patients, satisfactory results have been obtained by simply dividing the sensory portion of the root. The osseous opening required to expose the nerve root need

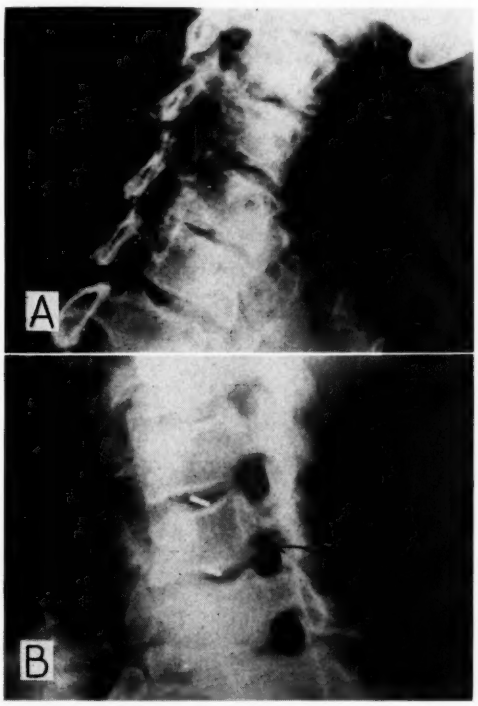

Fig. 8.—*A*, view taken obliquely, showing proliferative change crowding the intervertebral foramen. At operation the sixth nerve root was found to be tightly compressed. *B*, the spur projecting into the intervetebral foramen was squeezing the seventh nerve root.

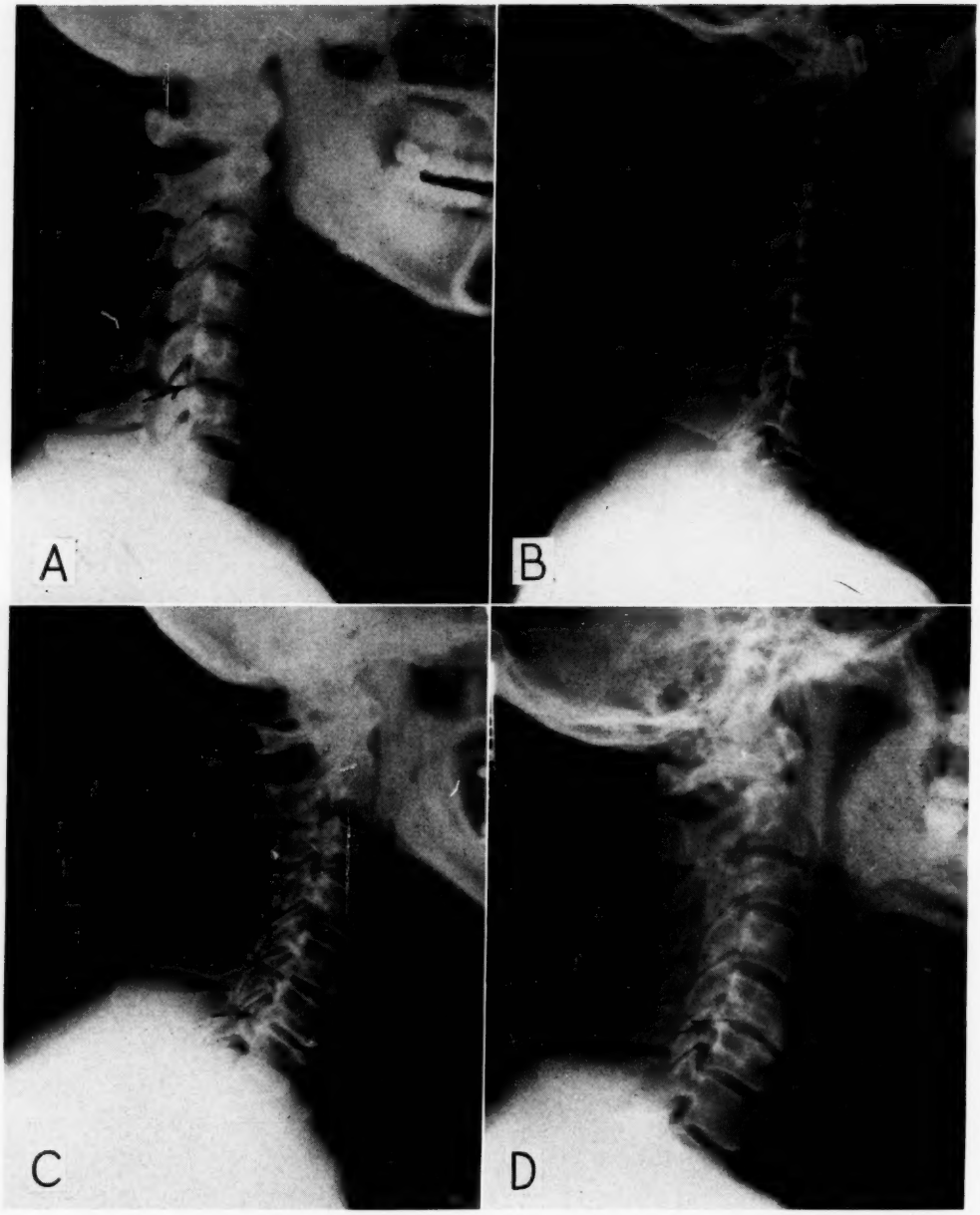

Fig. 9.—In *A*, the arrow indicates the level of the ruptured disc verified by operation. Note the reversal of the normal cervical lordosis. In *B*, note the loss of the normal curvature and the early hypertrophic changes about the disc between the fifth and sixth cervical vertebrae. In *C*, typical changes are shown which compressed the sixth and seventh cervical nerve roots. Both lesions were verified surgically. In *D*, the space between the fifth and sixth bodies is narrowed and the proliferative reaction is marked. The disc below also shows some changes.

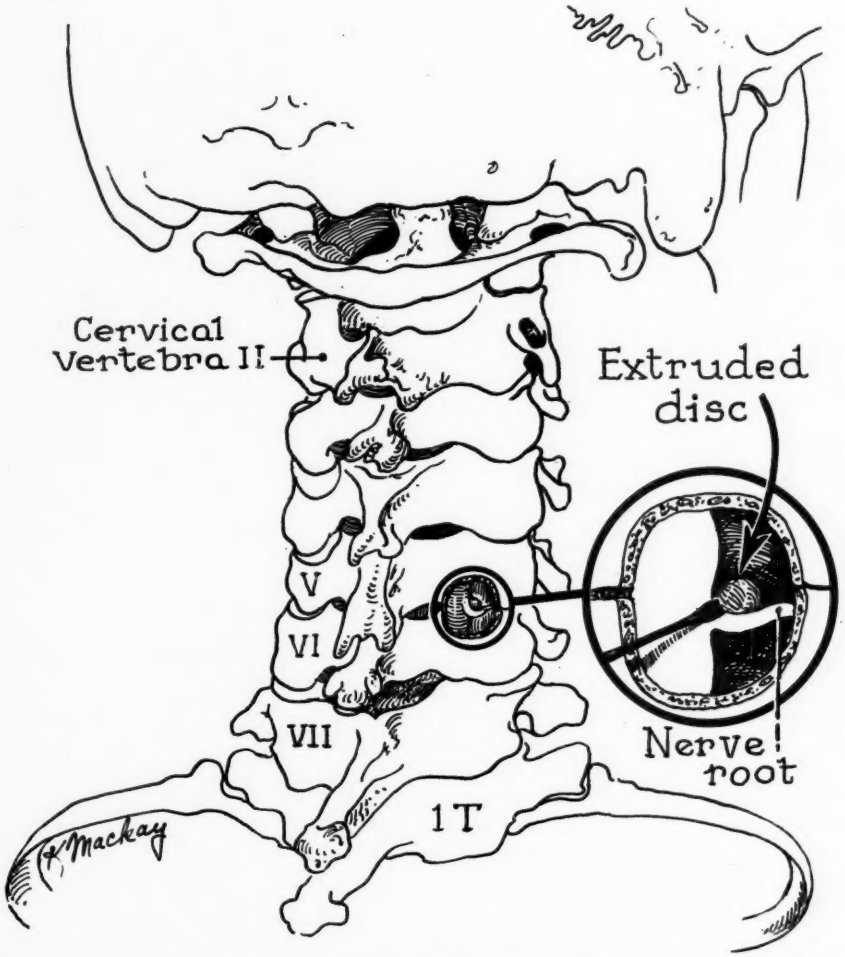

Fig. 10.—Dorsal view of cervical portion of spine, showing area of bone removal to expose the nerve root. In the enlarged area the nerve root is retracted to expose the herniated disc.

not be more than 1 cm. in diameter. Since this limited removal of bone causes no weakness of the spine, the patient can become ambulatory whenever he wishes. In general, the relief of pain has been quite satisfactory.

The severe pain is almost invariably relieved immediately after the operation, and the milder pain may be expected to subside gradually.

SUMMARY

The most common cause of shoulder and arm pain is the compression of a cervical nerve root by a lesion of the intervertebral disc. A diagnosis can be made with a high degree of accuracy.

Pain caused by compression of the cervical root usually subsides within a few days when treated conservatively. If the

pain is persistent and severe, however, surgical decompression of the nerve root is indicated. This is a relatively simple procedure, and the results obtained are excellent.

RÉSUMÉ

La cause la plus fréquente de douleur à l'èpaule et au bras est la compression de la racine cervicale d'un nerf secondaire à une lésion du disque intervertébral. Le diagnostic est des plus faciles à faire.

La douleur secondaire à une compression d'une racine cervicale rétrocède après quelques jours de traitement. Toutefois dans les cas de persistance de la douleur, il faut recourir à la décompression chirurgicale. Le procédé est simple et donne d'excellents résultats.

RESUMEN

La causa más común del dolor de hombro y brazo es la compresión de una raíz nerviosa cervical por una lesión del disco intervertebral. Puede diagnosticarse con gran exactitud.

El dolor causado por la compresión de la raíz cervical subsiste ordinariamente por varios días cuando se le trata conservadoramente. Sin embargo, si el dolor es persistente y severo se encuentra indicada la descompresión quirúrgica de la raíz nerviosa. Este es un procedimiento relativamente simple y los resultados que se obtienen son excelentes.

RIASSUNTO

La causa piu comune di dolore della spalla e del braccio e' compressione d'una radice del nervo cervicale da una lesione del disco intervertebrale. Una diagnosi si puo' fare con un alto grado di esatezza.

Dolore causato da compressione della redice cervicale ordinariamente e' placabile dentro di pochi giorni sotto il trattamento conservatismo. Se il dolore sia persistente e severo, intanto, decompressione chirurgica della radice del nervo sia indicata. Questa e' un procedimento relativamente semplice, ed i risultati ottenuti sono eccellenti.

ZUSAMMENFASSUNG

Die haeufigste Ursache von Schulter— und Armschmerzen bildet der durch die Verletzung einer Zwischenwirbelscheibe hervorgerufene Druck auf eine Halsnervenwurzel. Die Diagnose kann mit einem hohen Grade von Genauigkeit gestellt werden.

Der durch Druck auf die Halsnervenwurzel entstehende Schmerz verschwindet gewoehnlich in wenigen Tagen unter konservativer Behandlung. Ist der Schmerz aber bestaendig und heftig, so ist die chirurgische Entlastung der Nervenwurzel angezeigt. Dies ist ein verhaeltnismaessig einfaches Verfahren, und die erzielten Ergebnisse sind ausgezeichnet.

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The Exclusion Resection (Finsterer) for Nonresectable Duodenal Ulcers

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THE percentage of nonresectable duodenal ulcers reported by different authors ranges from 3 to 80; in general it has been eventually reduced. Our own figure in 1936 was 50 per cent and now is approximately 5 per cent.

In 1918 Finsterer[1] recommended his exclusion resection for these cases: a subtotal gastrectomy (Hofmeister-Finsterer) with closure oral to the ulcer. Originally he performed either a prepyloric closure, with or without removal of the mucosa, or a postpyloric closure; later, only the prepyloric transection with excision of the mucous membrane.

Technic. — The postpyloric closure, which was last described in 1942 by McNealy,[2] is theoretically sound as far as the prevention of marginal ulcers is concerned. However, it is never necessary and should be abandoned, as it is too dangerous (Table 1).

The standard procedure should be the prepyloric closure of the antrum with removal of the mucous membrane. The methods of Finsterer,[3] Wilmanns,[4] Druener,[5] Bancroft,[6] Buerkle-de la Camp,[7] Fischer,[8] Fromme,[9] Spak,[10] Wangensteen[11] and Plenk[12] are very similar, differing only as to details concerning the length of the cuff and the suturing. In cases of doubtfully resectable ulcers we divide the sufficiently mobilized stomach between two clamps 5 cm. from the pylorus, the blood supply of the antrum having been left intact. Only then do we decide whether a resection or an exclusion operation should be performed, both procedures being facilitated (Fig. 1).

Anastomosis.—Finsterer[13] has emphasized the importance of doing a retrocolic, no-loop, partial inferior gastrojejunostomy. We have also had good results with other types of anastomosis, with the exception of the antecolic, long-loop gastrojejunostomy with an enteroanastomosis.

Altogether different methods of dealing with nonresectable duodenal ulcers were described by Jacobovici[14] and Foeldessy,[15] the latter's procedure being a gastroenterostomy for exclusion. They have not found acceptance.

Mortality.—Our statistics on exclusion resections of various authors between 1918 and 1950, including prepyloric and postpyloric transections, shows a mortality rate of 5 per cent.

It should be kept in mind that 5 per cent is the assumed average mortality of the resection and that, for obvious reasons, the more difficult cases were selected for the exclusion operation. The mortality rate, however, is much lower if only the prepyloric exclusion operations are considered and if reduced to complications caused by the remaining ulcer or leakage from the stump (Table 1). With a single exception, the reduced mortality rates, if mentioned, range from 0.4 to 2.6 per cent.

Our own statistic (1930-1950) includes 264 prepyloric exclusion operations with 4 deaths (1.9 per cent) and 2 postpyloric exclusion resections with no death. The reduced mortality is 1 case (0.4 per cent).

The reduced mortality rates would surely be lower yet if they did not include cases in which the decision to perform an exclusion operation was made after an attempt to resect radically (as is specifically mentioned by Spak[10]). Most authors do not mention these cases, but in our opinion a reduced mortality rate much higher than 2 per cent (for instance, one

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statistic with a rate of 7-8 per cent), can be attributed to this cause.

Morbidity.—Some authors (e.g., Lewisohn[16]) consider the morbidity of this operation higher than that of radical resection, owing to leakage from the stump or complications from the ulcer, such as hemorrhage or perforation. This is surely not true for our cases. We encountered no hemorrhage and 2 nonfatal fistulas. The rare occurrence of hemorrhage is also emphasized by most authors. The exclusion operation should not be used for bleeding ulcers.

Marginal Ulcer.—That exclusion resection with removal of the antral mucous membrane is free from objections has been made probable by the experiments of Lannin[17] and Zuckschwerdt and Becker.[18] Fauley, Strauss and Ivy,[19] who noted a high percentage of marginal ulcers in their experiments with the Finsterer operation, seem to have left the mucosa of the antrum behind. That exclusion resections are not followed by marginal ulcers more frequently than radical resections may be proved by statistics; one should keep in mind that the latter have an incidence of marginal ulcers of about 2-6 per cent.

We have compiled a statistic on marginal ulcers from a total of 1,810 prepyloric exclusion resections. Some authors do not state their late results; in several instances, otherwise very valuable statistics could not be used because they do not give the results of prepyloric and postpyloric exclusion operations separately. Our statistic is therefore based on 1,040 selected cases of antral exclusion resection.

We consider the results of those cases in which the antral mucosa was removed very satisfactory. The value of excising the mucous membrane has been emphasized by Ogilvie,[20] Steinberg,[21] and Allen and Welch,[22] who had series of cases with the mucosa left in and with the mucosa removed. They found a very high incidence of marginal ulcers in the first and a very low incidence or none in the second series.

Late Hemorrhage.—We could not find a report of a late hemorrhage which could be attributed to the remaining ulcer and

TABLE 1.—*Mortality of Exclusion Resection: A Comparison of Prepyloric and Postpyloric Exclusion Operations**

	Number of Cases	Mortality		Reduced Mortality (Perforation, hemorrhage, leakage from stump)	
		Number	%	Number	%
Prepyloric exclusion resections	1,614	70	4.3	22—25 (of 1,349 cases)	1.6—1.9
Postpyloric exclusion resections	255	29	11.4	9 (of 96 cases)	9.4

*Compiled from statistics published between 1926 and 1950.

TABLE 2.—*Mortality of the Exclusion Resection (Prepyloric and Postpyloric)**

	Number of cases	Mortality	
		Number of cases	%
Zuckschwerdt and Horstmann (compiled from literature, 1918-1936)	1,834	98	5.3
Statistic compiled from literature (1926-1950) and including our own cases	2,043	106	5.2
Sum (cases included in both statistics subtracted)	3.582	183	5.1

*Compiled from the literature (1918-1950).

TABLE 3.—*Incidence of Marginal Ulcers After Prepyloric Exclusion Resection*

	Total Number of cases	Marginal Ulcers
With or without removal of mucous membrane	1040	48—52=4.6—5.0%
Mucous membrane not removed	47	13=27.7%
Mucous membrane removed	752	7—9=0.9—1.2%

TABLE 4.—*Prepyloric Exclusion Resections*

Total Number of Cases	Cured		Improved	Marginal Ulcers
	Excellent	Good		
158	126=79.7%	20=12.7%	5=3.2%	6 (reoperated) 1 (x-ray) 7=4.4%
	146=92.4%			

TABLE 5.—*Data on Resections for All Types of Ulcer*

	Billroth II		Billroth I		Sum	
	Number	Mortality Rate	Number	Mortality Rate	Number	Mortality Rate
Noncomplicated ulcer Callous gastric ulcer Callous duodenal ulcer	1,505	1.4%	195	0.5%	1,700	1.2%
Complicated ulcer Gastric and duodenal ulcer, marginal ulcer, perforated ulcer, acutely bleeding ulcer	287	5.9%	13	6.5%	300	6.3%
	1.792	2.1%	208	1.4%	2.000	2.0%

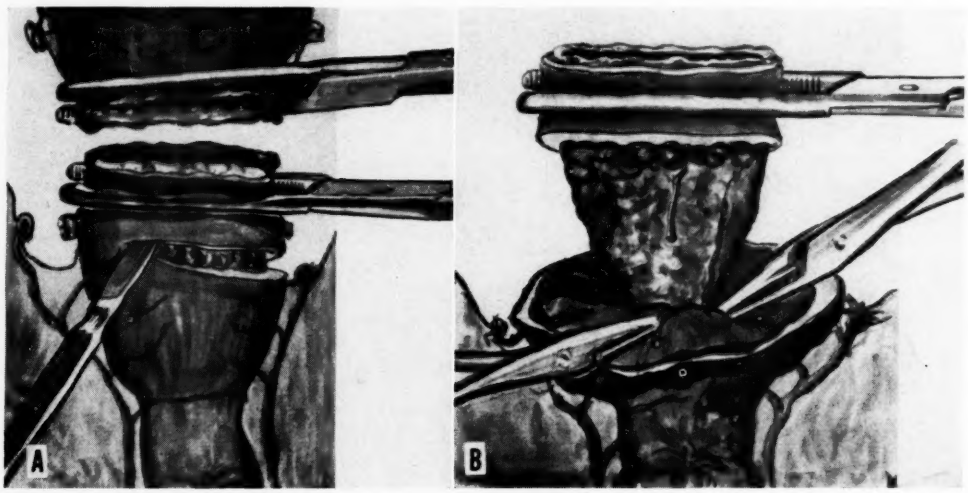

Fig. 1.—Author's technic. *A*, mobilized stomach divided between clamps (see text). *B*, excision of mucous membrane.

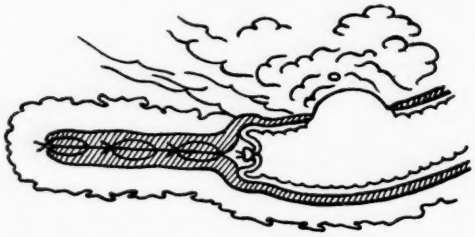

Fig. 2.—Sketch depicting completed exclusion resection for duodenal ulcer. Correctly performed, this procedure has given excellent results in the treatment of "nonresectable" ulcer.

have never seen one ourselves. We did, however, have a few cases of late hemorrhage of unknown origin among radical resections.

Follow-Up Statistics.—From the aforementioned, good results may be expected. They have been affirmed by exact follow-ups. Excellent results in 85 to 95 per cent of the cases have been reported by Finsterer,[13] Paraskevas and Sapkas,[23] and Makkas and Marangos.[24]

Authors' Statistic.—There were 264 prepyloric exclusion resections (1930-1950). Of these, 96 could not be located. Ten patients had died since the operation (accident, other illness); no information as to gastric condition was given. The number of cases with sufficient information was 158 (–59.8 per cent of operative cases), including 15 in which the patients had died from other than gastric causes, none having had gastric complaints up to the time of their death.

We consider these results equal to those of radical resection. In all 6 cases of marginal ulcer in which reoperation was done, a long-loop, antecolic gastrojejunostomy with an enteroenterostomy was performed after the method of Braun.

We believe that resection for exclusion not only has good results if considered by itself but has a favorable influence on the ulcer surgery statistics at large. The statistic of our last 2,000 resections for all types of ulcer, performed by 21 surgeons, confirms this opinion. Our last series without a death included 311 cases.

CONCLUSION

Makkas and Marangos[24] stated that the results of the exclusion resection are almost as good as those of the radical resection. The opinion of Paraskevas and Sapkas[23] and our own are still more favorable; we believe the method to be of equal value and its use in difficult cases, except in the presence of serious hemorrhage, fully justified.

SUMMARY

The Finsterer exclusion resection has given excellent immediate and late results in cases of "nonresectable" duodenal ulcer when a correct technic was used: prepyloric closure with excision of the antral mucosa, subtotal gastrectomy, no enteroanastomosis of the gastrojejunostomy. The method is not indicated in cases of serious hemorrhage.

RÉSUMÉ

La résection dite de Finsterer donne d'excellents résultats immédiats et éloignés dans le cas d'ulcères non réséquables du duodénum, à condition d'employer une technique parfaite: fermeture prépylorique avec résection de l'antre muqueux, gastrectomie sub-totale, sans anastomose intestinale de la gastro-jéjunostomie. Cette technique est contre-indiquée dans les cas d'hémorragie grave.

RESUMEN

La resección exclusión de Finsterer ha dado resultados inmediatos y tardíos excelentes en casos de úlcera duodenal —no resecable— si se ha usado una técnica correcta: cierre prepilórico con excisión de la mucosa antral, gastrectomía subtotal, sin enteroanastomosis de la gastroyeyunostomía. No está indicado el método en casos de hemorragia grave.

RIASSUNTO

La risezione di esculusione Finsterer ha dato risultati eccellenti immediato e tardivo nei casi di ulcero duodenale "non

risezionabile" se una tecnica esatta sia stata usuata; chiusura prepilocica con eccisione della mucosa antrale, gastrectomia subtotale, senza enteroanastomosi del gastrodigiunostomia. Il metodo non e' indicato in casi di emorragie gravi.

ZUSAMMENFASSUNG

Die Ausschlussresektion des Magens nach Finsterer ergibt ausgezeichnete Frueh—und Spaetresultate in Faellen von "unresezierbaren" Zwoelffingerdarmgeschwueren, wenn eine richtige Technik angewandt wird: praepylorischer Verschluss des Magens mit Exzision der Antrumschleimhaut, subtotale Magenresektion, Gastrojejunostomose ohne Duenndarmanastomose. Die Methode ist nicht angezeigt in Faellen von schwerer Blutung.

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Nature has given to men one tongue, but two ears, that we may hear from others twice as much as we speak.

—Epictetus

A good listener is not only popular everywhere, but after a while he knows something.

—Wilson Mizner

Splanchnicotomy for Prevention and Treatment of Urologic Disturbances in Diseases of the Spinal Cord

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THE majority of patients suffering from transverse myelitis eventually succumb to secondary renal damage eventuating in urosepsis as a result of pyelonephritis with or without urolithiasis; this because the disease is regarded as incurable and a fatal course is inevitable. In many cases, however, new conceptions concerning the formation of urinary calculi, as well as the development of new surgical methods, provide the possibility of controlling disturbances of the kidneys and urinary bladder associated with lesions of the spinal cord, and at least one is able to alleviate the suffering of the patients and to prolong the lives of a number of them.

The usual disturbances of the urinary bladder in these cases may be classified into three types. In Type 1, spinal cord lesions situated above the sacral segments produce the clinical picture of the so-called "*reflex bladder.*" Micturition is involuntary but complete; no residual urine remains; therefore, catheterization becomes superfluous after the primary shock of the injury has subsided. In Type 2 the vesical disturbances producing the clinical picture are those of an *autonomous* and an *atonic* bladder and are due to lesions of the second to fourth sacral segments or the corresponding spinal nerve roots. In either case permanent catheterization is required because of the large amount of residual urine. Considering these circumstances, it seems astonishing that lesions of the spinal cord associated with fractures and dislocations of the eleventh thoracic to the second lumbar vertebra, as most frequently observed by the surgeon in times of peace, produce paralysis of the urinary bladder instead of a "*reflex bladder,*" since the nervous damage originates considerably above the sacral segments. One must realize, however, that the paralysis here is the result of a combination of lesions of the spinal cord and its roots. In addition, the relation of the spinal cord and its roots to the vertebral bodies must be considered, and it should

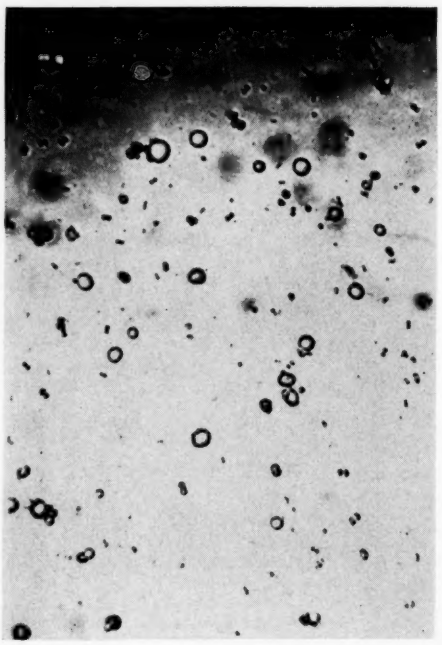

Fig. 1.—Urinary sediment ten minutes after peroral administration of oxamid (rat). Observe numerous colloidal bodies in the urine. × 300.

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be remembered that all of the five sacral segments are located in the area of the twelfth thoracic vertebral body. Therefore, if this or one of the adjoining vertebra is injured the result will be, on the one hand, paralysis of the bladder caused by the injury to the vesical center located in the sacral region, and, on the other hand, interruption (due to the lesion) of the nerve supply to the spinal cord roots situated in cord segments at a higher level.

War experiences have again corroborated the observation that lesions to the spinal cord associated with interruption of the ninth dorsal to the first lumbar roots will lead to the formation of renal stones almost without exception. On the other hand, lesions located above the second thoracic segment, as well as those below the second lumbar segment, very rarely cause the development of renal calculi. I have tried to explain this fact in a previous publication, and my theory of the formation of urinary concretions is based upon that paper. It is my impression that any formation of urinary calculi is the result of circulatory renal disturbances, which in turn are the result of a pathologic state of hyperstimulation of the splanchnic nerve. Although the ordinary predominance of the splanchnic nerve associated with spinal cord lesions between the ninth thoracic and the first lumbar segment is a well known fact, only the development of a *pathologic stimulation* of this nerve produces the disturbance of the renal blood supply and consequently the formation of calculi.

Should a latent stage of stimulation on the basis of a focal infection exist at the time of injury, the mere stimulus of the trauma may change the latent condition

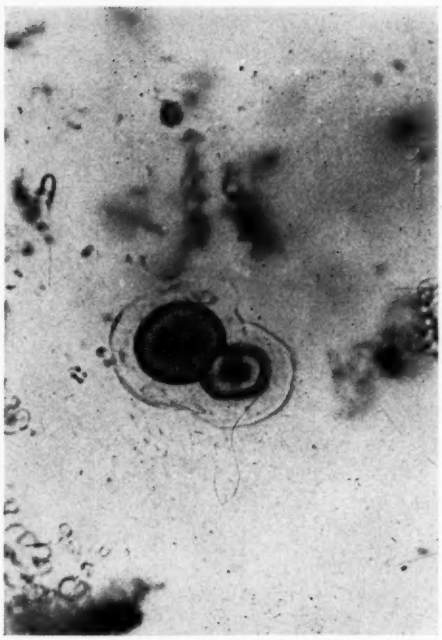

Fig. 3.—Urinary sediment in the rat after feeding with oxamid. Observe synthetic microlith with colloid capsule. × 300.

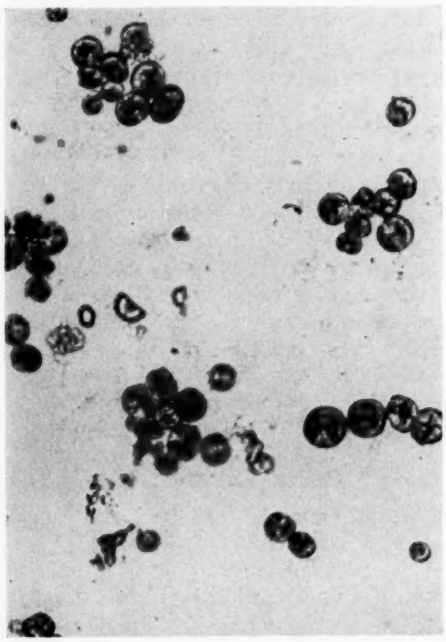

Fig. 2.—Ten minutes later. One may now observe secretion of spharoliths. × 300.

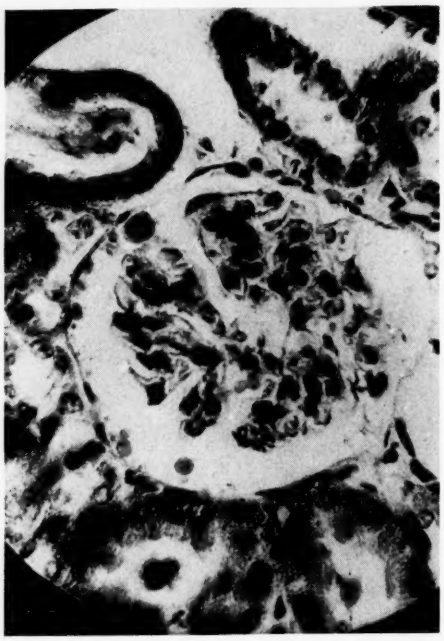

Fig. 4.—Kidney of rat. Glomerulus showing colloid concretion in Bowman's capsule. Cloudy swelling and accumulation of albumin droplets in the main section. × 500.

into an active one. In the majority of cases, however, such stimulation is produced by the renal infection that results from the bladder paralysis and as a result of permanent catheterization. The infection acts via a vaccination-sensitization mechanism on the splanchnic nerve, particularly since this nerve is in absolute control of renal function. The cause of renal stone formation in spinal cord injuries between D-9 and L-2 is therefore to be looked upon as a disturbance of balance of the renal nerve supply in connection with the renal infection.

Thus it becomes clear what path we have to follow in order to prevent a disturbance of the uropoietic system as a result of lesions of the spinal cord. In damage to the spinal cord between D-9 and L-2, not only is the influence of the splanchnic nerve to be eliminated but an ascending infection must be prevented. In damage to the cord below L-2 down to S-4, which in spite of associated pyelonephritis is relatively seldom followed by nephrolithiasis, one may be satisfied with prevention of an infection. The prevention of infection, however, requires the liberation of the patient from the catheter, i.e., restitution of the ability to urinate, because every permanent catheterization will eventually produce a vesical infection which, with the existing atony of the ureters, will invariably cause ascending pyelonephritis.

Until now all interventions on the autonomic nervous system have been unsuccessful. They have failed to restore the power of spontaneous micturition. Rocher's operation, however, is able to accomplish this by a simple and easily executed procedure that does not impose too much discomfort upon the patient. It consists in suturing a taut piece of rectus muscle to the anterior wall of the bladder. Since the rectus muscle receives its nerve supply from the fifth to the twelfth dorsal segments, the operation may always be performed in cases of paralysis of the bladder. Therefore the principle of Rocher's procedure is based on the conception of furnishing the bladder with a nerve supply. The effect of the operation, however, becomes manifest within a few days; therefore it seems probable that contraction of the detrusor muscle is accomplished through the mechanical pull of the rectus muscle graft. It produces a stimulation of the intramural nerve plexus in the bladder, whence the detrusor receives its impulses. The elevation of the pelvic floor by the taut pull of the rectus muscle plays a contributory role.

This simple operation was rediscovered by Boeminghaus and was followed by immediate success in 4 out of 5 cases in which I operated. Three patients, each with an autonomous bladder resulting from a spinal cord injury, and 1 patient with a corresponding bladder disturbance resulting from a myelocystocele were able to empty the bladder spontaneously and

completely on the fifth day after the operation—that is, immediately after removal of the catheter. The failure of the operation on the fifth patient, who also had paralysis of the bladder following a spinal cord injury, in my opinion, was due to insufficient tension of the rectus traction during the operation. Two additional operations performed by May [Munich] were also successful.

It need not be emphasized what this operation affords to the patient both physically and psychologically. As has been mentioned, in cases of spinal cord injury associated with the loss of nerve supply from the ninth dorsal to the second lumbar segment, it is necessary to eliminate simultaneously the splanchnic nerve in order to prevent stone formation. The kidney will be freed from the influence of the splanchnic nerve, so that stages of stimulation cannot develop or become effective. The resulting improvement of the renal blood circulation also counteracts the development of severe pyelonephritis. This operation is accompanied by marked shock to patients who suffer from injury, not to speak of the fact that the damage suffered by the vertebra will not permit the positioning of the patient that is necessary for resection of the splanchnic nerve. However, the transthoracic severing of the splanchnic nerve with the aid of the thoracoscope, as described by Kux [Innsbruck], or the exeresis of the nerve by the same procedure, as described by Picard [Cairo], provide methods which may well be undergone even by these enfeebled patients. I should like to recommend this simple procedure warmly. It is important, however, that the splanchnicotomy, as well as Rocher's operation, be resorted to soon after the injury, before a major infection has set in. Conservative treatment seems to me to be outmoded. One should not condemn the patient to decrepitude as long as there is a possibility of helping him and preventing major damage and other complications. This procedure seems to offer the best possibility of both.

SUMMARY

1. Types of so-called "cord bladder" are discussed.

2. The advantages of Rocher's operation are pointed out.

3. To avoid stone formation, a splanchnicotomy with a thoracoscope after Kux or Picard is recommended.

RÉSUMÉ

1. On y discute différents types de "cord bladder".

2. On recommande les avantages de l'opération dite de Rocher.

3. Pour prévenir la lithiase, à l'aide du thorascope, on pratique une résection du splanchnique selon la méthode Kux ou Picard.

RESUMEN

1. Se discuten los tipos de la llamada —cord bladder—.

2. Se puntualizan las ventajas de la operación de Rocher.

3. Se recomienda una esplacnicotomía con toracoscopio, según Kux o Picard, para evitar la formación de piedra.

ZUSAMMENFASSUNG

1. Es werden verschieden Typen der sogenannten "Rueckenmarksblase" eroertert.

2. Die Vorzuege der Rocherschen Operation werden dargestellt.

3. Zur Vermeidung von Harnsteinbildungen wird die Splanchnikusdurchschneidung mit Hilfe eines Thorakoskops nach Kux oder Picard empfohlen.

RIASSUNTO

1. Discute tipi cosi' detto "vescica neurologica".

2. Gl 'avvantaggi del operazione Rocher sono indicati.

3. Raccomanda splanchnicotomia con un toracoscopo secondo Kux o Picard per evitare formazione di pietra.

Pitfalls to be Avoided in Thyroidectomy

A Triangle for Localization and Protection of the Recurrent Nerve

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TECHNICAL operative complications still contribute to many thyroid deaths, and too many recurrent nerves are still being injured during thyroidectomy.[1] The reported occurrence of nerve injury from large goiter clinics varies from 0.5 to 8 per cent[2] and is much higher in secondary operations and during the removal of malignant and large nodular goiters. The incidence of nerve injury has now increased since the advent of the antithyroid drugs.[3]

Although many injuries to the recurrent nerve and their sequelae have been reported by various authorities,[4] these probably represent only a small fraction of the total number, for surgeons do not feel disposed to advertise their errors. That the incidence of nerve injuries is higher than the present inadequate statistics would indicate is borne out by the ever-increasing number of operations for the relief of recurrent nerve paralysis which have appeared in recent literature.[5] If the number of patients who have sustained injury to the recurrent nerve during thyroidectomy were known, it probably would be tremendous. And, since no method of treatment for paralysis of the recurrent nerve has yet yielded satisfactory results, prevention is still the only sure remedy.[6]

The recent addition of the thiourea group of drugs to the preoperative preparation of patients with hyperthyroidism would appear to have made the patient entirely safe for operation, but it has made operation less safe for the patient.[7] This group of drugs, while lowering the basal metabolic rate to normal, leaves the thyroid gland in an enlarged and markedly hyperplastic state, so that satisfactory anatomic exposure at the time of operation is more difficult. The gland is reduced in consistency, soft, friable and very hemorrhagic.[8] Although these difficulties are lessened by the omission of propylthiouracil seven to ten days prior to operation and the preoperative administration of iodine, the gland is still left in a state of subinvolution and hyperplasia with its attendant surgical disadvantages and increased tendency to nerve injury.[9] I have therefore employed propylthiouracil in preoperative preparation only when it was felt that lugolization alone was insufficient. For severely ill and toxic patients, however, the advantages of the thiouracils far outweigh their disadvantages. When properly prepared with these drugs, patients do come to operation in good general condition. This permits a careful and precise operative technic with no race against time, which compensates in a large measure for the disadvantages just enumerated.

The most precise dissection of the structures in close proximity to the nerve is mandatory. The importance of localizing the recurrent nerves at the time of operation has been firmly established by many authorities.[10] Lahey and others[11] have written forcefully of the necessity of visualizing the recurrent nerves during thyroidectomy and have proved this a practical and safe procedure in thousands of operations. Although the importance of visualizing the nerve has been sufficiently accepted, localizing and exposing

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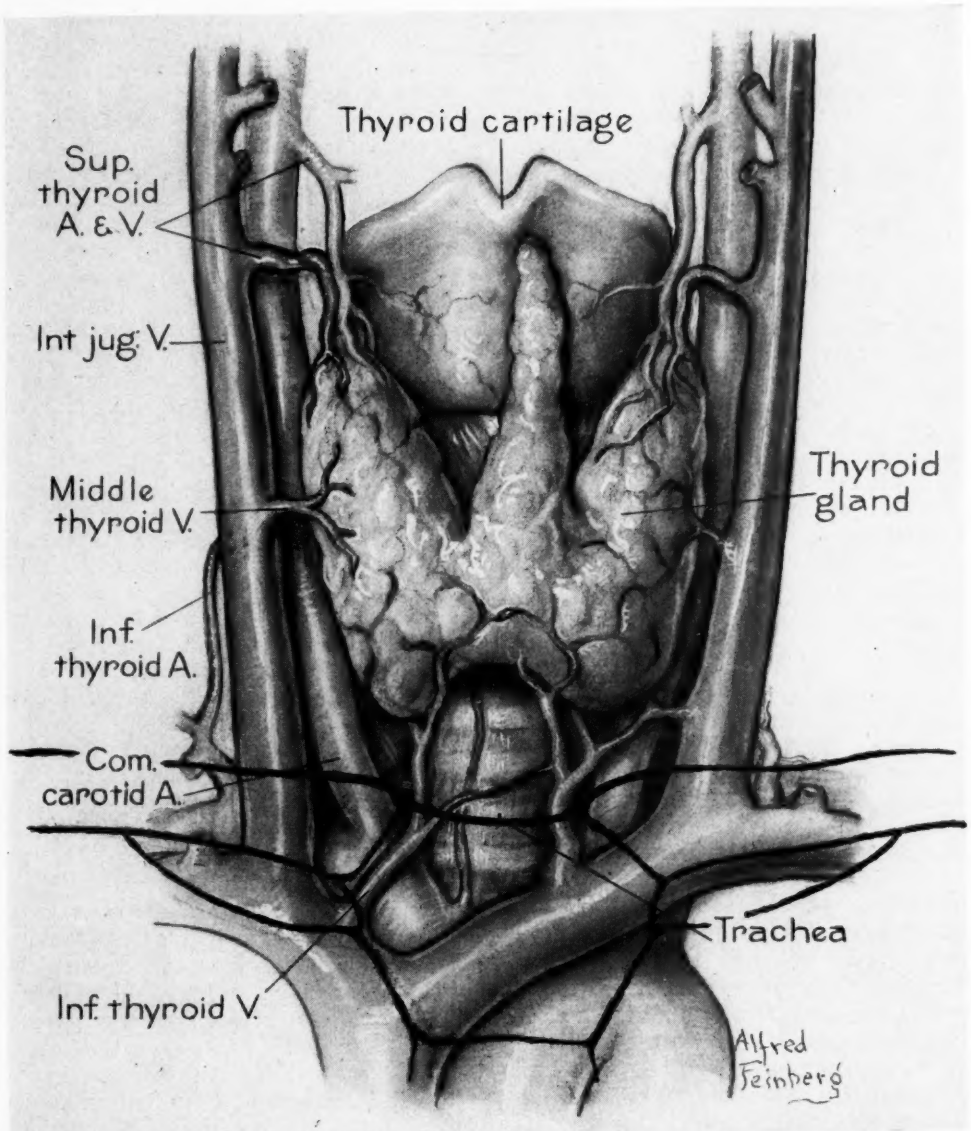

Fig. 1.—The thyroid gland and its blood supply, showing its relations to the larynx, trachea, sternum and clavicles. The blood supply of the thyroid is greater than that of any other structure approached surgically[18]. No other organ in the human body has been so well supplied with blood. In proportion to its weight, it receives eight times as much blood as the head. It has been shown to be five and a half times more vascular than the kidney. The blood to the thyroid is supplied by four main trunks. All the blood in the body passes through it once an hour. Anomalies, when they do occur, lead to an even greater circulation. Nature has seen to it that nothing should interfere with the blood supply to this vital structure. The importance of this gland is demonstrated in the vegetative type of existence observed in cretins who are born without the gland, or in myxedema which develops in those who have lost it after birth or through surgical extirpation. Palpation for an anomalous ima vessel adds an item of safety here. Care should be exercised in the enucleation of substernal goiters to avoid tearing the large veins.

the nerve often proves to be a troublesome and time-consuming job in a dangerous area. A surgeon who is not thoroughly familiar with the detailed anatomy here may cause more harm than good by routine attempts to visualize the nerve.

All the anatomic and technical pitfalls are still not fully appreciated. Every goiter operation, no matter how simple, is fraught with great danger, since one small technical error may convert a patient with a mild thyroid disability into one in immediate danger of death or prolonged misery. Injury to one or both nerves occurs not infrequently even in the hands of those skilled in thyroid surgery. Injury to the recurrent nerve, tetany, and persistent and recurring hyperthyroidism still challenge the surgeon.[12] Tetany often goes hand in hand with nerve injury (Fig. 4), and fear of nerve injury is responsible for large remnants and recurring hyperthyroidism (Fig. 4).

Lack of anatomic knowledge and fear of recurrent nerve injury has often "stampeded" the surgeon to limiting himself to a fractional resection of the gland. The part of the gland frequently left behind is as much diseased as the part removed. Preservation of function is often given as the reason for leaving these large remnants, but fear of injury to the recurrent nerve is often greater than fear of producing myxedema. That state of mind often results in inadequate removal of tissue, for the surgeon becomes conservative as the feared structures are approached. Though every thyroid surgeon knows the general position of the recurrent nerves, the greatest tragedies that follow thyroid operations follow their injury. Studies of large series of cases have confirmed the fact that damage to the nerve is frequently the result of operative trauma, i.e., accidental division, crushing, or inclusion in a suture during thyroidectomy.[13]

These injuries usually result in permanent paralysis of the recurrent nerve. Injury to even one nerve may cause postoperative symptoms severe enough to require tracheotomy, and bilateral injury is a major catastrophe. Indeed, the prevention of death demands complete protection of the recurrent nerves during operation, since the control of the laryngeal musculature is transmitted entirely from the central nervous system through these nerves. The inferior or recurrent laryngeal nerve is practically the only motor nerve of the larynx.[14] The superior laryngeal nerve is the sensory nerve of the larynx, supplying only a single small motor branch (the external) to the cricothyroid muscle. Practically all movements of the intrinsic muscles of the larynx, therefore, are controlled by impulses transmitted through the inferior or recurrent nerves.

The recurrent nerve is peculiar not only anatomically but physiologically.[15] It performs the function of double impulse nerve conduction in a single trunk. That is, it carries two sets of fibers to opposing muscles, the abductor and the adductor. These muscles open and close the glottis. Although the chief function of the larynx in man and animal is to prevent the entrance of anything but air into the lungs, this organ is now known to have ten well established functions: (1) phonatory; (2) respiratory; (3) protective; (4) deglutitory; (5) tussive; (6) circulatory; (7) fixative; (8) expectorative; (9) emotional; and in grazing animals the larynx participates in a tenth function, olfaction. This gives the animal the full power of smell even though the mouth is open, thus helping in the detection of undesirable food. It is not the scope of this paper to enter into a detailed discussion of the physiology of the larynx and vocal cords, but it is important that their numerous vital functions be understood, since both the vocal cords and the larynx are controlled by the recurrent nerves. It is thus apparent that any injury to the recurrent nerves impairs all the functions aforementioned and that bilateral recurrent nerve paralysis is a major calamity. Immediate or delayed operations for the repair or reconstruction of the cut or otherwise

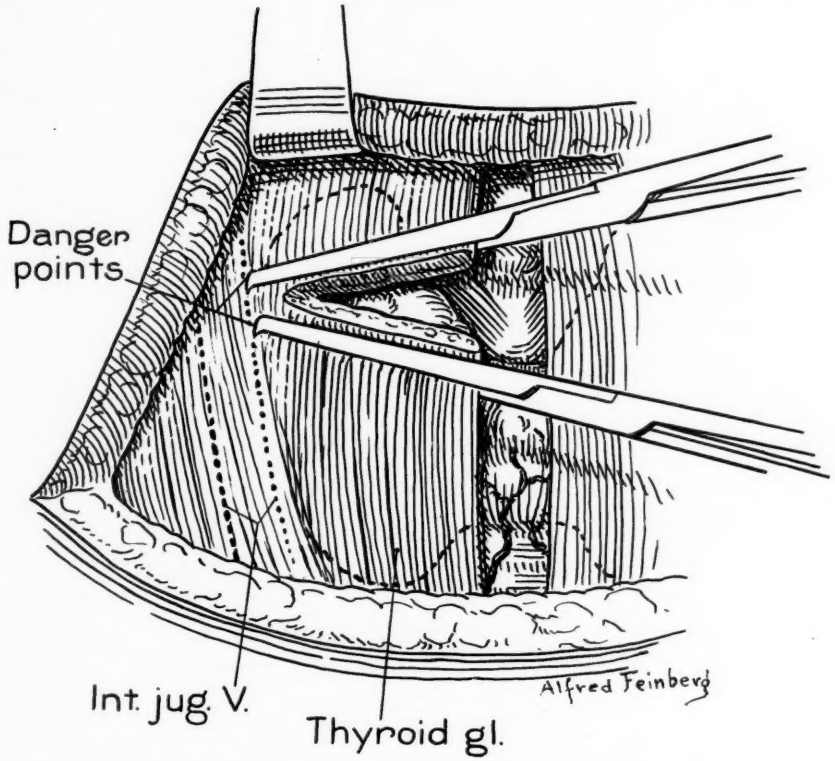

Fig. 2.—The skin flap is elevated above the level of the notch in the thyroid cartilage. This permits adequate exposure of the superior pole. The clamps are applied across the prethyroid muscles at a high level, in order not to disturb their innervation. The clamps should be applied under direct vision in order to safeguard the internal jugular vein.

mutilated recurrent nerves are not only extremely difficult, but to date no one has reported a proved return of functions even after immediate direct anastomosis.[16] It is doubtful that restoration of function will ever be accomplished by this method, because of the double impulse nerve conduction in the single trunk of the nerve as has been described.

Hence, the success of the operation hinges on the recurrent nerve. The recurrent nerve still dignifies the thyroid operation, because any operation upon the thyroid gland, no matter how trivial, endangers the nerve, and without functioning recurrent nerves life is short and miserable. Therefore, any method which helps reduce the incidence of nerve comlication deserves serious consideration.

In 1943 I described an anatomic triangle based on fixed boundaries which makes localization of the nerve simple, speedy and safe.[17] The triangle is easily identified and remembered and emphasizes a vital triangular area in thyroid surgery, just as Calot's triangle brings to mind and emphasizes a vital triangular area in biliary surgery. Knowledge of the boundaries of the triangle makes localization and identification of the recurrent nerve a simple and rapid maneuver. This anatomic triangle is bounded laterally by the common carotid artery, above by the inferior thyroid artery, and internally by

the recurrent nerve. To avoid injury of the nerve, familiarity with this area is best obtained by cadaver dissection. The anatomy of this region, when well learned on the cadaver, fortifies the operator's confidence in operating on the thyroid.

add some suggestions which were omitted in the previous paper.

Rough handling or premature attempts to elevate the gland will not only tear large veins but can cause serious hemorrhage, serious only because it obscures

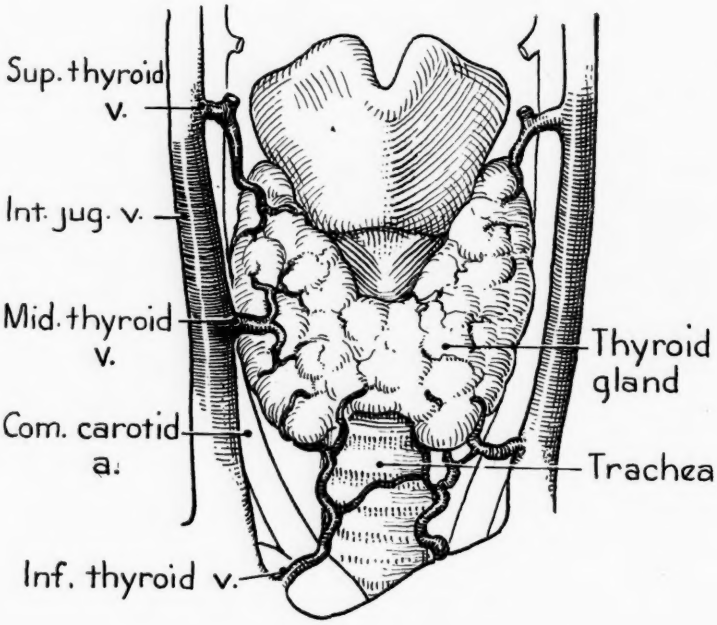

Fig. 3.—The middle thyroid vein arises from the lateral aspect of the lobe of the gland and passes laterally and empties into the internal jugular vein. There may be more than one. These veins vary both in length and in diameter.[14a] The middle thyroid vein may be very thin, short, distended and easily torn when enucleation of the lobe is attempted. It is a common source of troublesome hemorrhage. When the gland is exposed and partially mobilized, the middle thyroid vein comes into view and careful dissection at this point is very important. The middle or lateral thyroid vein is not always prominently distended. Elevation and traction of the lobe empty it. It is thin-walled; it tears easily and, if not controlled promptly from the beginning, stains the area with blood and makes the subsequent dissection difficult. A short middle thyroid vein as shown above draws the internal jugular medially, where it may be injured if the Kocher clamps are applied blindly during division of the strap muscles (Fig. 2). Note that the superior and inferior thyroid veins are often long and tortuous, permitting elevation of the lobe after the middle thyroid vein has been divided.

My method of exposing the triangle during thyroidectomy is essentially the same as that reported in 1943.[17] What I have observed and heard since encourages me to review some things which were presented in detail at that time, and to

all the landmarks and vital structures. Hence, a painstaking ligation and division of the lateral or middle thyroid vein binding the lobe to the internal jugular is important. One must adopt a fundamental anatomic approach and anticipate any

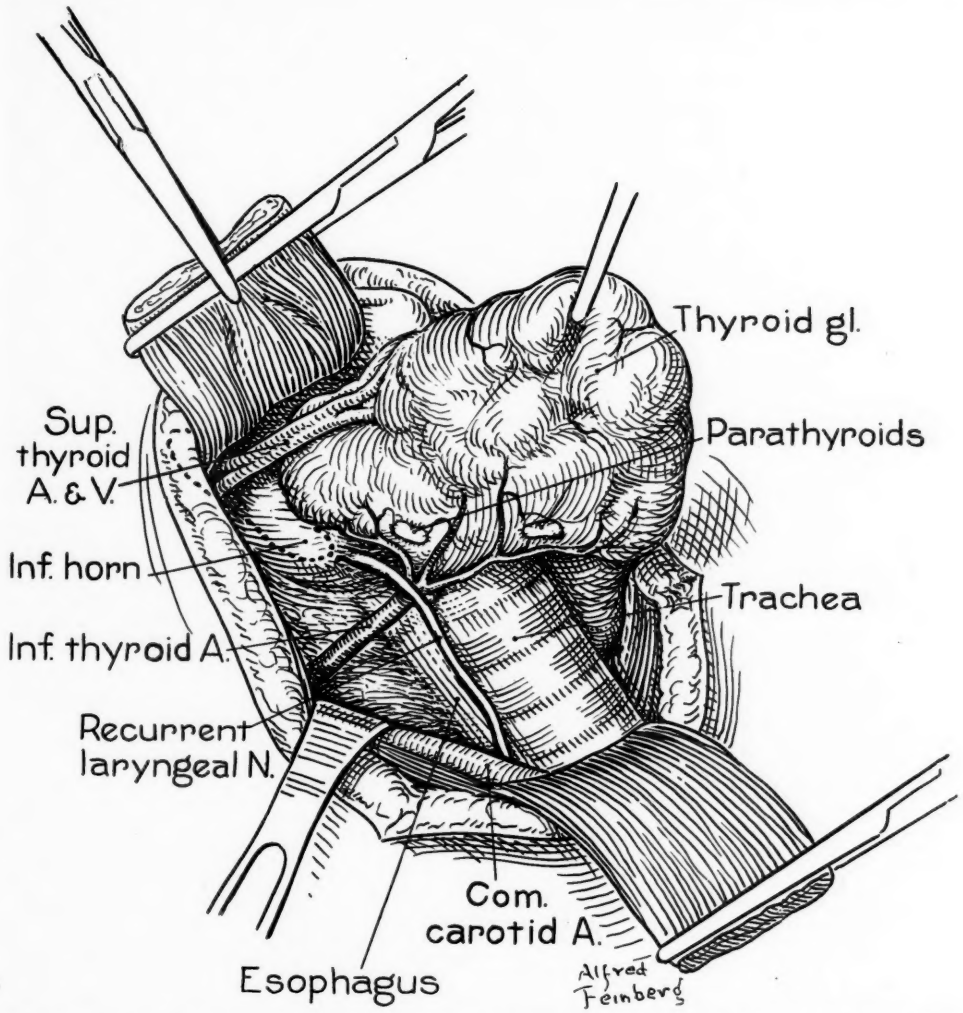

Fig. 4.—Drawing of author's dissection, showing the elevated lobe. The lobe should be elevated and delivered carefully to prevent tearing of sclerotic vessels. Note that the triangle is exposed without severing the superior pole or the inferior thyroid artery. These vessels are usually tortuous, with sufficient slack to permit elevation of the lobe. The nerve is now visualized, and extracapsular ligation of the vessels can be done. Note that the nerve here is anterior to the artery. A consideration of the anatomy of the parathyroids discloses that the same precaution used against recurrent nerve injury serves to protect the parathyroids.

variation, since any possibility can become an actuality. The accompanying drawings, with their legends, clearly illustrate the method of exposing the triangle. In many instances only the middle or lateral thyroid vein requires detachment. Division of this vein usually permits elevation of the lobe and exposure of the triangle. Occasionally the superior pole and the inferior thyroid veins require detachment for more satisfactory elevation of the lobe of the gland. Complete detach-

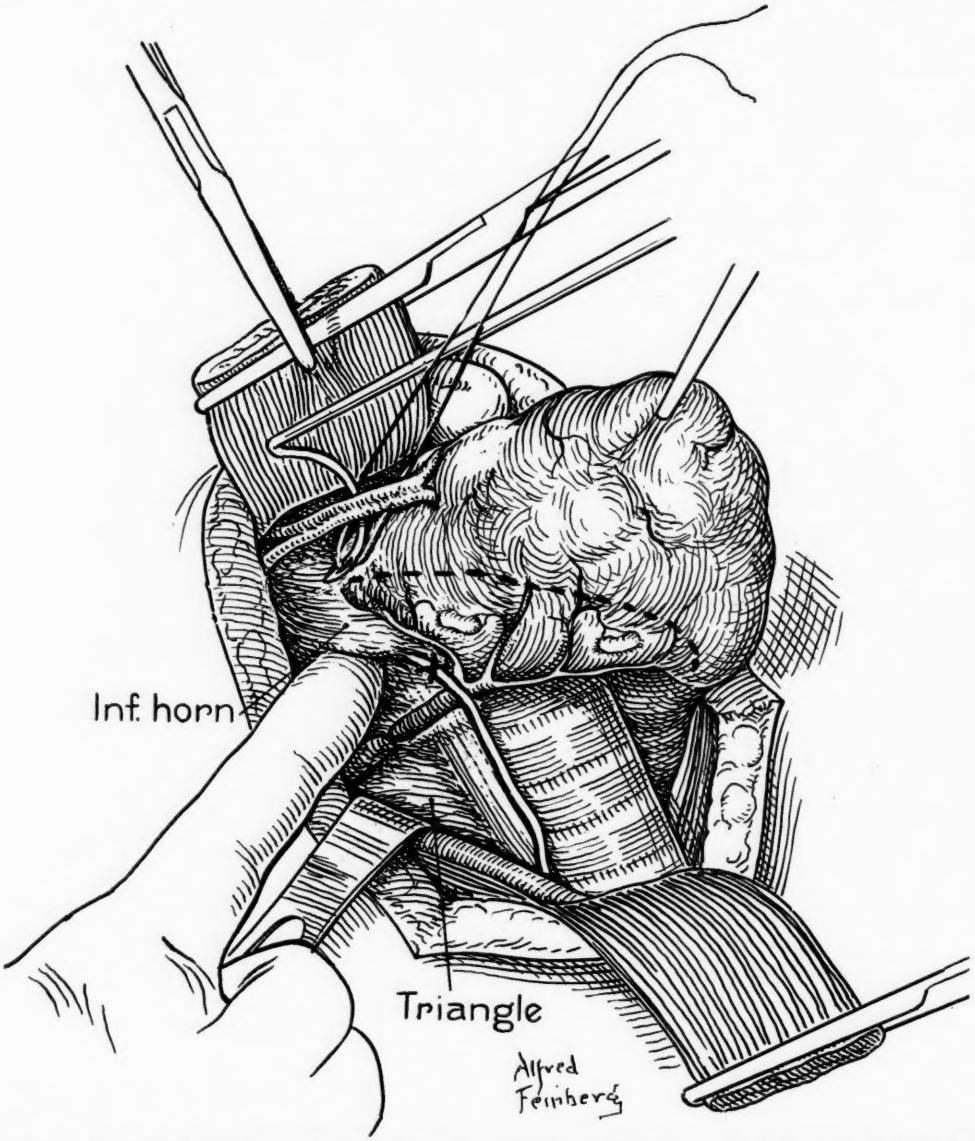

Fig. 5.—The inferior thyroid artery is uniformly at least one-third larger than the superior thyroid and is anatomically less variable.[22] Note that the superior thyroid vessels are secured from within outward, with the surgeon's left index finger palpating the inferior horn of the thyroid cartilage. This avoids the terminal branch of the recurrent nerve just as it dips under the inferior horn. X indicates the common site of nerve injury, i.e., where the upper branch of the inferior thyroid runs parallel to the nerve. Although the recurrent nerve may be traumatized at any point in its course through the operative field, it is more exposed to injury at the point marked X, because the nerve is hidden here by the lower fibers of the inferior constrictor muscle and obscured by bleeding from the upper branch of the inferior thyroid. Clamping or suturing a bleeding point in this area or anywhere in the neighborhood of the inferior horn of the thyroid cartilage (which is easily palpable) is fraught with great danger to the nerve. Bleeding in this area is controlled when the trunk of the inferior thyroid artery is ligated as it comes up from behind the carotid. This method of dealing with the inferior thyroid artery has alone reduced the incidence of recurrent nerve injuries to 1ero in a series of 230 cases, with no parathyroid tetanies or other complications.[1c]

ment of the lobe of the thyroid from the internal jugular vein, however, is seldom required for satisfactory visualization of the triangle. The superior pole is, therefore, usually not divided until the triangle is exposed (Figs. 4, 5 and 6).

Any attempt to save the few minutes required for localization of the triangle and extracapsular ligation of the vessels may be dearly bought. Once the triangle is properly exposed, the surgeon never need fear bleeding or the slipping of a ligature, for the arterial supply to the lobe is in view and under the finger; hence bleeding is easily controlled under direct vision.

With the better preparation of the patient for surgical treatment of the thyroid today, speed has become less important than a careful anatomic technic; besides, a more precise technic does not always prolong the operation. Roughness and haste can prove disastrous. Rupturing a vessel while dislocating the lobe is not uncommon. Tearing the gland by excessive traction can produce severe hemorrhage. The thyroid arteries must be handled gently, because they are apt to be brittle and may easily be torn or cut through by a ligature that is tied too tightly. Rough elevation of the lobe is especially hazardous in old goiters which have undergone degenerative change because the thyroid vessels may be sclerotic and calcified. In patients with sclerotic vessels or chronic thyroiditis, therefore, it is important to have adequate exposure and to proceed carefully.

Overconfidence is a danger in surgery as in any other undertaking. Even when a procedure seems safe, it is still wise for the surgeon to pause and consider ways of making it safer. One can never afford to be overconfident, especially in operations for goiter, whatever his experience may have been.

Since the major causes of injury to the recurrent nerve are poor exposure and hemorrhage, the surest way to avoid these dangers is to obtain good exposure and adequate control of the blood supply early.[18] This is accomplished when the thyroid triangle is exposed. With extracapsular ligation of the inferior thyroid artery, there is less bleeding. Although the blood supply of the thyroid is greater than that of any other structure approached surgically and the control of bleeding is important, the real danger is seldom from loss of blood. Unexpected hemorrhage from a torn or cut branch of the inferior thyroid artery is frequently the beginning of a vicious circle. The inexperienced surgeon fails to realize that compression or extracapsular ligation of the trunk of the inferior thyroid artery stops the bleeding. Instead of this, wild clamping or suturing is often resorted to, with injury to the recurrent nerve. Blind attempts to control bleeding in this area from branches of the inferior thyroid artery can produce injury not only to the nerve but the trachea, the parathyroids and even the esophagus.[19]

Experience has shown that it is much easier routinely to ligate in continuity one single trunk (the inferior thyroid artery) a safe distance away from the nerve than to attempt to secure its branches and ramifications, which are in intimate relation to the recurrent nerve and the parathyroids.[20] Trouble is avoided if the inferior thyroid artery is secured at an early stage of the operation. De Quervain insisted upon the advantage of securing the arteries before approaching the veins.[10b] In fact, he made it a rule to secure the inferior thyroid artery first. Since extracapsular ligation of the inferior thyroid artery is hazardous unless the recurrent nerve is first visualized, it is safer to identify the nerve before ligation of the vessel. This is achieved when the triangle is exposed as described (Figs. 4, 5, 6*A* to 6*H*, and 7).

After the lobe of the gland is delivered and the triangle visualized, the whole lobe is felt and seen before any operation is performed upon it (Figs. 4 and 5). Many mistakes have been made from lack of this precaution. It is difficult to tell how much of the lobe is being removed if the entire lobe is not visualized. If the gland is not rotated from its bed,

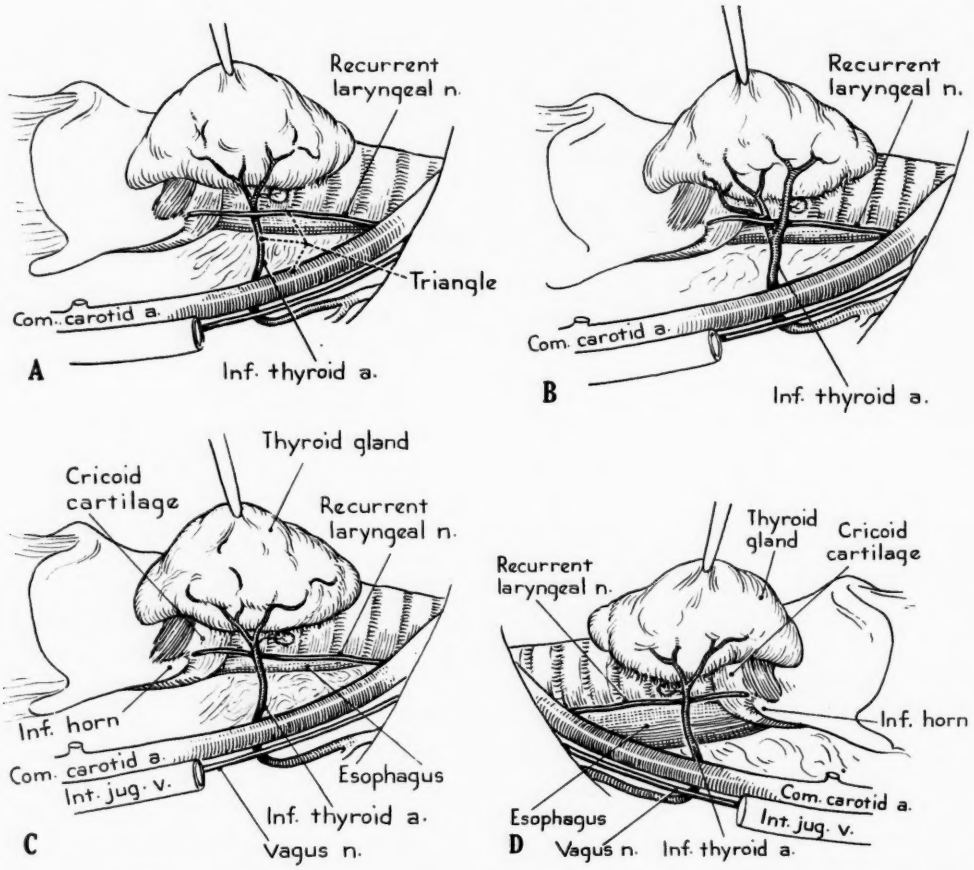

Fig. 6.—Variations of the inferior thyroid artery in its relation to the recurrent nerve in the dissected triangles. When the nerve is anterior or between the branches of the inferior thyroid artery as shown in Figures 4, 5, 6*A*, 6*E*, and 6*F*, it is especially liable to injury unless the boundaries of the triangle are identified. Following the inferior thyroid artery to the lobe leads to the nerve when it is anterior. Variations in the recurrent nerve are uncommon.[21] Variations in the inferior thyroid artery are the more frequent cause of accidental injury to the recurrent nerve.[21b] *A*, drawing of the author's dissection, showing the triangle on the right side with its three boundaries. The recurrent nerve here is anterior to the inferior thyroid artery. This is an occasional relationship and occurred 7 times in 86 triangles dissected by the author in 43 cadavers. *B*, drawing of the author's dissection, showing a triangle on the right side with the recurrent nerve passing between the branches of the inferior thyroid artery. This is an uncommon relationship and occurred 4 times in the 86 triangles. Note the intimate relationship of the upper branch of the inferior thyroid artery to the recurrent nerve. *C*, drawing of the author's dissection, showing a triangle on the right side with the recurrent nerve posterior to the inferior thyroid artery. This is the usual relationship and occurred 32 times in the 86 triangles. Note that the floor of the triangle is formed almost entirely by loose areolar connective tissue. *D*, drawing of the author's dissection, showing a triangle on the left side. The recurrent nerve here is posterior to the inferior thyroid artery. This is the usual relationship and occurred 33 times in the 86 triangles dissected. Note that the esophagus is more prominent on the left side and partially forms the floor of the triangle.

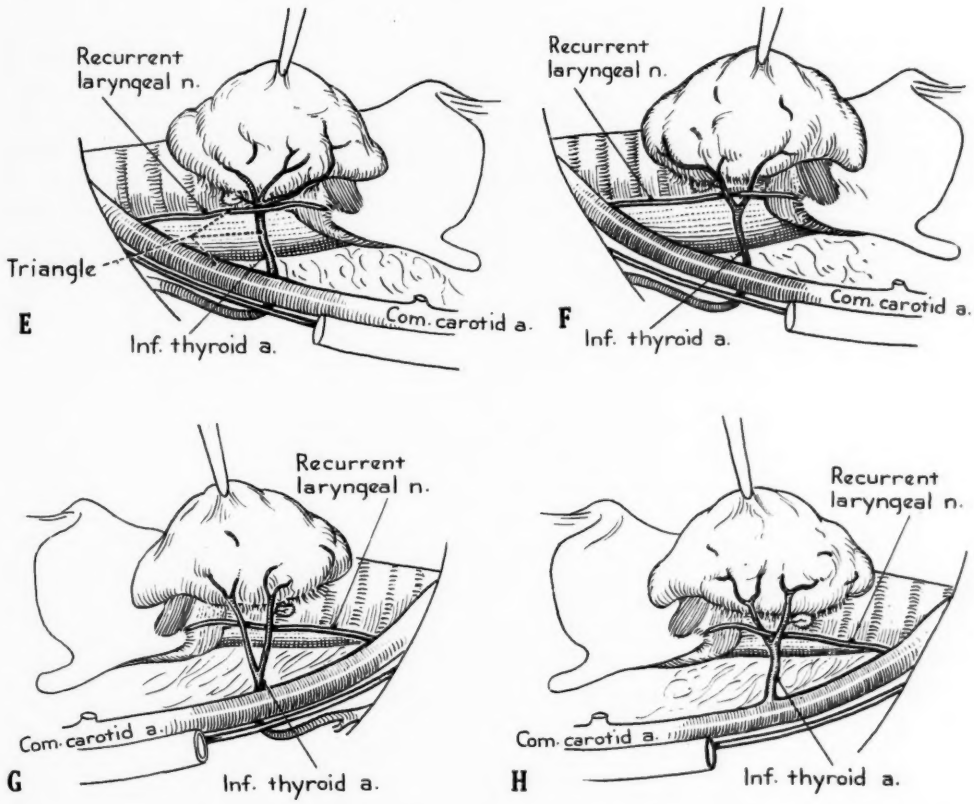

Fig. 6 (*continued*).—*E*, drawing of the author's dissection, showing a triangle on the left side with the recurrent nerve anterior to the inferior thyroid artery. This is an occasional relationship and occurred 8 times in the 86 triangles. Note the intimate relationship of the upper branch of the inferior thyroid artery to the recurrent laryngeal nerve. *F*, drawing of the author's dissection, showing another triangle on the left side, with the recurrent nerve running between the branches of the inferior thyroid artery. This is a rare relationship and occurred twice in the 86 triangles. *G*, drawing of the author's dissection, showing a bifurcation of the inferior thyroid artery just under the carotid, giving the impression of a double inferior thyroid artery. This was encountered once in 86 triangles. The lateral gutter must be searched carefully for this anatomic variation. The division occurs behind the carotid sheath, and the overlooked trunk may be the source of free bleeding when the gland is resected. *H*, an inferior thyroid artery coming directly off the common carotid. This anomaly was encountered once in the 86 triangles dissected.

it is impossible to estimate the exact amount of thyroid tissue left. Moreover, parathyroids occasionally are visualized and spared. A more complete removal of the lobe is thus possible and insures that no large remnants are left behind. The consensus is that it is far better to err on the side of complete removal, since postoperative hypothyroidism is greatly preferable to persistent toxicity. Besides, in certain thyrocardiac patients myxedema is even desirable.

There is occasionally such wide variation in the gross pathologic character of

the gland that one cannot standardize the operation to too high a degree. The technic must fit the observations. Localization of the triangle is recommended, but with the reservation that in a certain number of cases this procedure may be difficult or even undesirable. If anomalies make it difficult to locate the inferior thyroid artery, or anomalous ramifications of the lateral thyroid veins obscure the posterior aspect of the gland and its adjacent structures, or if the gland is friable, adherent, or difficult to mobilize, or any difficulty is encountered to complete lateral exposure of the lobe, one has no choice but to omit extracapsular ligation of the inferior thyroid artery. When the triangle cannot be visualized and extracapsular ligation of the inferior thyroid artery cannot be accomplished, the incidence of recurrent nerve injury has been shown to be greater.[21] It is an axiom of surgery that anything which cannot be seen, especially if it is in the operative field, is in danger of injury. There certainly can be no argument about the necessity for localization of the nerve in complete thyroidectomy; or enlarged bilateral adenomatous lobes without normal thyroid tissues; or diffuse toxic goiters in which cardiac damage or carcinoma of the thyroid is present.

The triangle, when exposed, visualizes the common carotid and inferior thyroid arteries and the recurrent nerve in the order mentioned, and occasionally a parathyroid body at the intersection of the inferior thyroid artery with the recurrent nerve (Figs. 4 and 5).

This insures adequate and safe removal of the involved gland.

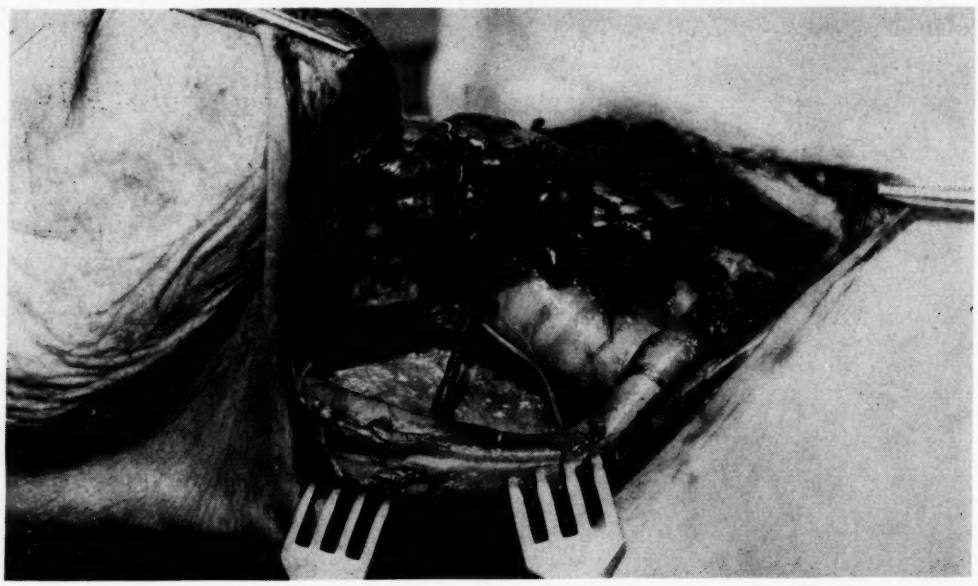

Fig. 7.—Photograph of the author's dissection of a triangle on the right side. The inferior horn of the thyroid cartilage has been bared in order to show the recurrent nerve terminating under the horn. The superior pole vessels have not been severed in order to indicate the preferred site of ligation; i.e., above the level of the inferior horn of the thyroid cartilage (see Figure 5). Note the parathyroid body just outside the triangle. Note the branching of the recurrent nerve. The nerve occasionally divides into two branches, one of which supplies the adductors and the other the abductors and constrictors of the larynx. It is, therefore, possible to produce either abductor or adductor paralysis by injury to the respective branches and to produce intermediate or cadaveric paralysis by injury of the trunk of the nerve (King [see references 1[1] and 2[c]]).

Fig. 8.—Photograph of the author's dissection of the recurrent laryngeal nerve, showing the triangle on the left side. The recurrent laryngeal nerve runs somewhat deeper on the left side. It courses up along the tracheoesophageal groove to terminate under the inferior horn of the thyroid cartilage. The triangle, however, is maintained. Note the superior pole vessels above the level of the inferior horn of the thyroid cartilage. Note that the esophagus is more prominent on the left side and partially forms the floor of the triangle, whereas on the right side the floor is formed almost entirely of areolar connective tissue.

SUMMARY

The author describes a relationship of the recurrent laryngeal nerve, the inferior thyroid artery and the common carotid artery. These structures consistently form a triangle. The nerve forms the inverted base of the triangle, while the two arteries form the other two boundaries. The nerve crosses usually behind, sometimes in front of the inferior thyroid artery, and occasionally between its branches. The common carotid artery is easily identified by its size, its location in the carotid sheath, and its pulsation. The inferior thyroid artery, a branch of the thyrocervical trunk, approaches the posterolateral surface of the thyroid lobe, coming from behind the carotid sheath and entering the gland at the level of the cricoid cartilage and carotid tubercle of the cervical portion of the spine. These three structures thus produce the aforementioned triangle. Most injuries to the nerve occur in the vicinity of branches of the inferior thyroid artery. The method of exposing the triangle is described, and the pitfalls to be avoided in thyroidectomy are discussed.

RÉSUMÉ

L'auteur décrit ici les rapports du nerf récurrent (laryngé), de l'artère thyroidienne inférieure et de la carotide. Ces éléments forment toujours un triangle. Le nerf se trouve à la base inversée du triangle, tandis que les deux artères, les deux côtés. Le nerf traverse habituellement en arrière de la thyroide, quelquefois en avant et quelquefois entre les branches.

La carotide est facile à identifier par son diamètre, sa localisation et sa pulsation. L'artère thyroide inférieure, une branche du tronc thyro-cervical suit la face postéro-latérale de la thyroide en venant de la carotide, pénètre das la glande au niveau du cartilage cricoide et du tubercule carotidien de l'épine dorsale cervicale. Ces 3 éléments forment donc ainsi le triangle plus haut décrit. La plupart des accidents qui surviennent au nerf, se font au voisinage des branches de l'artère thyrodienne inférieure. L'auteur décrit ici une méthode pour localiser le triangle et ainsi éviter les achoppements qui surviennent durant une thyroidectomie.

RESUMEN

Se describe una relación del nervio recurrente laríngeo, la arteria tiroidea inferior y la arteria carótida primitiva. Estas estructuras forman consistentemente un triángulo, cuya base invertida está formada por el nervio y los otros dos lados por las dos arterias. El nervio pasa ordinariamente detrás, a veces por delante de la arteria tiroidea inferior y ocasionalmente entre sus ramas. La arteria carótida primitiva es fácil de identificar por su tamaño, localización en la vaina carotídea y su pulsación. La arteria tiroidea inferior, rama del tronco tirocervical, llega a la superficie posterolateral del lóbulo tiroideo de la parte posterior de la vaina carotídea, entrando a la glándula a nivel del cartílago cricoide y el tubéerculo carotídeo de la columna cervical. Estas tres estructuras forman entonces el mencionado triángulo. Muchas de las lesiones del nervio ocurren en la vecindad de las ramas de la arterio tiroidea inferior. Se describe el método para exponer el triángulo y se discuten las dificultades que deben evitarse en la tiroidectomía.

ZUSAMMENFASSUNG

Der Verfasser beschreibt die Beziehung zwischen dem Nervus recurrens, der unteren Schilddruesenarterie und der Arteria carotis communis. Diese Gebilde formen stets ein Dreieck. Der Nerv stellt die Basis des auf dem Kopfe stehenden Dreiecks dar, waehrend die beiden Arterien die anderen beiden Seiten bilden. Der Nerv ziecht gewoehnlich hinter und manchmal vor der unteren Schilddruesenschlagader entlang; gelegentlich verlaeuft er zwischen ihren Aesten. Die Carotis communis ist an ihrem Umfang, ihrer Lage in der Karotisscheide und ihrer Pulsation leicht zu erkennen. Die ùntere Schilddruesenschlagader, ein Ast des Truncus thyreocervicalis, tritt an die hintere laterale Flaeche des Schilddruesenlappens heran. Sie kommt von der Hinterflaeche der Carotisscheide und betritt die Schilddruese in der Hoehe des Cricoidknorpels und des Tuberculum caroticum des sechsten Halswirbels. Diese drei Strukturen bilden so das oben erwaehnte Dreieck. Die meisten Verletzungen des Nerven erfolgen in der Umgebung der Aeste der unteren Schilddruesenarterie. Eine Methode, das Dreieck frei zu legen, wird beschrieben, und die bei der Schilddruesenresektion zu vermeidenden Gefahren werden eroertert.

RIASSUNTO

L'A. ha descritto un parentado del nervo laringeo ricorrente, l'arteria tiroidea inferiore, e l'arteria comune carotidea. Queste strutture formano conseguentemente un triangolo. Il nervo forma la base inverso del triangolo, mentre le due arterie formano gli'altri termini. Il nervo attraversa i n d i e t r o ordinariamente, qualche volte davanti l'arteria tiroidea inferiore, ed occasionalmente fra i suoi rami. L'arteria tiroidea comune e' identificata facilmente dal calibro, dalla locazione nel fodero carotidea, e dalla pulsazione. L'arteria tiroidea inferiore, un ramo del tronco tireocervicale, avvicina la superficie postero-laterale del lobo tiroideo arrivando d'indietro il fodero carotideo ed entrando la ghiandola a livello della cartilagine cricoideo e tubercolo carotideo della spina cervicale. Queste tre strutture di questo modo producono il suddetto triangolo. I piu frequenti traumi al nervo si presentano nella vicinanza dei rami dell

'arteria tiroidea inferiore. Il metodo di esporre il triangolo e' descritto e le trappole di essere evitare nella tiroidectomia sono discusse.

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Echoes of the Past

VIII. A Medical Legend of 1874

Dusting the cobwebs from ancient volumes and periodicals, one finds an occasional curious item in the archives, apparently recorded in all seriousness. The following Civil War story appeared in the *American Medical Weekly* of November 7, 1874; contributed by a Dr. L. G. Capers of Vicksburg:

A certain widow had two daughters, one aged fifteen and the other seventeen. These ladies were patriotically moved to care for the wounded. Their home was opened to the casualties of war. On May 12, 1863, their residence was in the line of fire between a portion of Grant's army and a group of Confederate soldiers. During the battle a gallant and noble friend of the narrator was wounded. He staggered and fell to the ground. Almost simultaneously a piercing cry was heard in the house of the widow with two daughters. Examination of the wounded soldier showed that a bullet had passed through the scrotum and carried away the left testicle. The same bullet had apparently penetrated the left side of the abdomen of the seventeen-year-old girl, midway between the umbilicus and the anterior superior spinous process of the ilium, and had become lost in the abdomen. The girl suffered an attack of peritonitis, but recovered in two months under the treatment administered.

Just two hundred and seventy-eight days after the impact of the minie ball she was delivered of a boy weighing eight pounds.

The hymen was intact, and the young mother strenuously insisted upon her virginity and innocence.

About three weeks after this remarkable birth Dr. Capers was called to see the infant, and the grandmother insisted that there was something wrong with the child's genitals. Examination showed a rough, swollen and sensitive scrotum, containing some hard substance. He operated, and extracted a smashed and battered minie ball. His conclusion was that this was the same ball that had carried away the testicle of his young friend, that it had penetrated the ovary and uterus of the young lady, and that some spermatozoa upon it had impregnated her. With this conviction he approached the young man and told him the circumstances. The soldier appeared skeptical at first, but consented to visit the young mother. A friendship ensued, which soon ripened into a happy marriage. The pair had three subsequent children.

This story does not have any semblance of possibility. It is, however, an example of the heights of imagination to which a medical mind may rise.

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Tumors of the Jaws

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TUMORS of the jaws are of clinical importance to the dentist and several medical specialists. The general practitioner himself should be sufficiently familiar with these tumors to recognize them early, that proper reference of the patient may be made quickly for adequate treatment and rehabilitation. In the past, therapy of tumors of the jaws has been too conservative, largely because of poor functional and cosmetic results. Advances in plastic and reconstructive surgery and the increasing use of prosthetic appliances have removed the bugaboos of disfigurement, poor phonation, and difficulty in masticating and swallowing. We have 2 patients, young women, who had the jaws resected for benign tumor which could have become malignant later; in 1 the resected portion of the mandible was regenerated from the remaining periosteum, and the patient wears a splendid prosthesis. The second patient required bone grafting. Both young women have married, and one is now a mother. Two other examples of good rehabilitation may be cited: A minister lost his jaw and considerable soft tissue because of cancer of the gingiva; he is now preaching twice on Sunday (in German and English) with the aid of a public address system. The other patient is a woman of middle age who lost her jaw and adjacent soft tissue from cancer of the tongue and floor of the mouth. She now sings in a choir.

Because the jaws arise as maxillary and mandibular processes of the first branchial arches and are covered with epithelium, and because jaws also contain teeth, the variety of tumors that may occur in the jaws is almost legion. Fortunately, however, tumors of the jaws are not common, especially the more serious types. The jaws are bones covered with epithelium. In this paper the discussion will be limited entirely to tumors primary in the jaws; that is, those arising from the epithelium of tooth germ elements, connective tissue, bone, and blood vessel tumors. Since this paper is largely clinical, a prolonged embryologic discussion will not be given. The results of a study of 534 cases of tumors of the jaws are presented in Table 1.*

CLASSIFICATION

The number and diversity of types of tumors of the jaws often complicate classification, confusing the student who is not familiar with jaw tumors and the clinician who sees them but rarely. Table 2 gives a classification which we hold to be simple and readily understood. There are two main types of primary tumors in the jaws; (*1*) those arising from ectroderm and (*2*) those arising from mesoderm. A third and less common type is the mixed tumor having both ectodermal and mesodermal elements. A fourth type requires mention, although fortunately it is not common; the occasional metastatic tumor associated with carcinoma or sarcoma elsewhere in the body. In this group may

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*Three hundred and thirty-eight of these cases were reported by Geschickter in 1935. Our study of 196 cases began with those patients who entered the Johns Hopkins Hospital after that date.

TABLE 1.—*534 Primary Tumors of the Jaws (Johns Hopkins Hospital)*

Epithelial and benign osseous tumors..		467
Radicular cysts	66	
Follicular and dentigenous cysts....	33	
Central epithelial cysts	1	
Adamantinomas	109	
Odontomas	5	
Giant cell epulis	112	
Central giant cell tumors	27	
Osteomas and ossifying fibromas....	114	
Malignant osseous tumors		48
Osteogenic		
Sclerosing	17	
Chondral	11	
Ewing's sarcoma	19	
Nerve tissue tumor	1	
Primary epithelial tumors		19
Epidermoid cancer exclusive of antral tumors	10	
Adenocystic basal cell epitheliomas..	8	
Aberrant salivary tissue tumors....	1	

also be included benign or malignant tumors which invade the jaws from adjacent soft tissue or from the antrum.

ROENTGEN CHARACTERISTICS

Careful roentgenologic study of tumors of the jaws over a period of years, in which diagnosis has been checked by histologic examination, has led us to the following conclusions, which are helpful, but not absolute, in making a provisional diagnosis prior to biopsy or operation.

Benign Tumor.—It is not always possible to differentiate between simple or multilocular cysts and some benign nonosseus tumors. As a rule, both produce a radiolucent area or areas with a more or less regular outline and with a small, dense white line at the edge. They may be single, multiple, or multilocular.

Benign nonosseus tumors, when of sufficient size, expand the jaws and thin the cortex or destroy it by pressure, but they do not invade the cortex, and they do not initiate a periosteal reaction. They are usually oval or circular.

On the other hand, osteofibroma may not have a definite border, and may expand and thin the cortex without periosteal reaction.

There is no definite soft tissue change surrounding the benign tumor in the jaws. Benign giant cell tumors are apt to have trabeculations, but these are not always present, particularly if the shadow is singular. Trabeculations may be present also in ameloblastoma, fibrocystic disease and myxoma. In the last-mentioned condition the trabeculations are apt to be in the form of lines through the tumor instead of round compartments (Thoma).

Position of the Teeth: Benign cysts and tumors may appear at the apex or side of the teeth. By definition a dentigerous cyst contains the crown of a tooth, although fibro-osteomas and adamantinomas occasionally enclose the crown of a tooth in a radiolucent area. The areas may be more opaque when they contain bone spicules. The teeth are often displaced by pressure of a benign cyst or tumor, the direction of displacement depending upon the relation of the pathologic process to the crown, root or neck of the tooth. The root of a tooth may be destroyed by pressure of a benign tumor. It is interesting that the root of a tooth is rarely destroyed by a malignant process; rather, it is common for the root literally to hang in the bone cavity resulting from malignant destruction. Such malignant destruction may be caused by central malignant neoplasm, primary or metastatic; or by invading neoplasm from adjacent tissue.

Malignant Tumor.—Invasion of the jaw by a malignant tumor usually gives an irregular, moth-eaten appearance. "Bones react to the growth of tumors in very much the same way whether the tumors are benign or malignant, primary or secondary. This reaction is also independent of whether a skeletal tumor is soft or is bone-producing. With rare exceptions . . . the reaction of tumors of bones can be regarded as a combination of two principal changes. The first is characterized by the resorption of bone tissue, caused by growth of the tumor; the second is characterized by the production of new bone, compensating for the loss of bone in developing mainly under functional stimuli" (Weinmann and Sicher, 1947).

Since malignant tumors cause rapid resorption of bone, permitting little time for new bone formation, irregular areas of

bone loss appear as radiolucent spaces of varying size and shape. The bone cavities may show some bone opacity caused by the presence of tumor tissue itself. Occasionally there may be new bone spicules laid down, or new bone may develop beneath the periosteum at the edge of the tumor (Codman).

Ameloblastomas represent a more or less intermediate stage between malignancy and benignity. Since ameloblastoma tends to hollow out small, more or less rounded areas in the bone, a honeycomb or soap-bubble appearance may result. In 2 of our cases of adenocystic basal cell epithelioma the mandible appeared to have been shot through with buckshot; each little hole representing true bone destruction by a nest of malignant cells.

In the presence of malignancy the bone destruction may be central, alveolar or peripheral. Central destruction occurs if the malignant growth is primary in the central portion of the mandible or metastatic from neoplasm elsewhere. Alveolar destruction is usually due to invasion from the adjacent mucous membrane, and peripheral destruction occurs as direct extension takes place from an attached neoplasm along the lateral, the lower or the

TABLE 2.—*Ectodermal Tumors (Primary in Jaw)*

Congenital	Dental Epithelium	Oral Epithelium	Neural
Fissural cysts Nasoalveolar Median Globulomaxillary Nasopalatine Incisive canal Cysts of papilla palatina	Odontogenic cysts Follicular (primordial) cysts Radicular (cholesteatoma) Peridontal cysts Dentigerous cysts Odontogenic tumors Ameloblastoma Ameloblastic-epithelioma Enameloma Odontoma (epithelium only)	Adenocystic basal cell epithelioma Cylindroma Central carcinoma Dermoid cyst	Peripheral nerve tumors

Mixed Tumors (Ectoderm and Mesoderm)

Salivary Tissue Tumors Odontoma-mixed			

Mesoderm (Primary in Jaw)

Traumatic	Osseous	Connective Tissue	Odontogenic	Giant Cell Tumor
Localized osteitis fibrosa with or without cysts Traumatic cysts	Benign Hyperostosis Exostosis Torus palatinus Torus mandibularis Osteoma Fibrous osteoma Chrondroma & osteochondroma Giant cell tumors (osteoclasts) Malignant Osteogenic sarcoma various forms	Cementoma Dentinoma Fibroma-central Fibromyxoma Fibrosarcoma-central Angioma-central Endothelial myeloma (Ewing's tumor) Multiple myeloma Granulomatous diseases	Soft odontomas Giant cell epulis (odontoclasts)	Endothelial type

Metastatic (Secondary) Tumors

Ectoderm carcinomas	Mesoderm sarcomas

medial border of the mandible. Neoplastic processes in which new bone is laid down (osteogenic sarcoma), often produce a typical sunray appearance. This phenomenon was also seen in 1 of our cases of anaplastic carcinoma arising apparently in odontogenic rests in a boy aged 7 years.

Periosteal reaction, if any, is slight or none, around malignant tumors of the jaw (Ewing). Codman (1926) described the lifting of the periosteum at the edges of the growth as the "reactive triangle".

Osteomyelitis: When it is remembered that osteomyelitis, as a rule, attacks the organic substances in bone and inorganic salts are dissolved only to a small degree, it is easy to understand how a sequestrum is formed. Sequestra are not always present and occur only after the disease has progressed for a considerable time. The loss of bone substance gives an irregular, moth-eaten appearance in the roentgenogram, not always distinguishable from malignant disease, especially when the malignant process begins in the central part of the jaw. Periosteal reaction may be present in osteomyelitis of the jaws, as with osteomyelitis in other bones. In the roentgenogram, new bone is seen beneath the displaced periosteum. This type of periosteal reaction is seldom encountered with malignant neoplasms.

I. ECTODERMAL TUMORS PRIMARY IN THE JAWS

Congenital Anomalies.—Retained epithelial rests occasionally are found at the places of fusion of the various embryonic processes which go to make up the jaws. These epithelial rests grow to form cysts, which have been named "fissural cysts". They commonly occur around the anterior portion of the hard palate. *Nasoalveolar cysts* occur in the anterior part of the nostril or wing of the nose and are associated with swelling of the upper lip. *Median cysts* arise in the midline of the maxilla or mandible. *Globulomaxillary cysts* form at the junction of the globular and maxillary processes and occur in the alveolar bone between the roots of the second incisor and the canine teeth, causing them to diverge. *Nasopalatine cysts* form in the incisive canal and may occur in the center of the bone, where they are called "incisive canal cysts", or under the papilla palatina in the incisive foramen, when the name "cysts of the papilla palatina" is applied.

Tumors of Dental Epithelium.—During the development of the jaws, epithelial appendages develop from the basal layer of mucous membrane. These tooth buds produce the enamel organ which forms the crown of the tooth; the root of the tooth arises from the mesodermal tissue of the primitive jaw itself. Cysts from dental epithelium are true cysts, since they are formed from epithelium and lined by epithelium. Cysts seen in localized osteitis fibrosa and traumatic cysts of the jaws may be lined by epithelium secondarily growing from a fistulous tract.

Odontogenic cysts are true cysts arising from dental epithelium and are classified into four main groups; follicular, radicular, peridontal and dentigerous. In the roentgenogram a radiolucent area is seen with well defined, regular edges, with a characteristic white line caused by the cortical bone encapsulating it.

Follicular (primordial) cysts form during the developmental stage of the tooth and consequently occur in young patients. They may remain symptomless until later in life. These simple follicular cysts contain no teeth and are most commonly seen in the third molar region. The first symptom to call attention to the cyst may be expansion of the jaw without pain.

Radicular cysts (epitheliated granuloma) occur most commonly at the roots of the teeth, which differentiates them from follicular cysts and dentigerous cysts. They may occur at the lateral surface of the root. These cysts are thought to have origin in chronic infectious granulomas at the side or apex of the tooth. They occur in the maxilla as well as in the mandible. The cysts contain a thick, mucoid or watery thin fluid. They may be filled with granulation tissue. Cholesterin crystals may become abundant owing to tissue disintegration. In multiple cysts

trabeculation may be seen, and if the edge of the cyst is irregular and moth-eaten, adamantinoma must be borne in mind.

Peridontal cysts may be either follicular or radicular. The follicular cysts may develop from a partly erupted or retained tooth or from supernumerary tooth germs. The radicular peridontal cysts develop similarly to the radicular cysts already described.

Dentigerous cysts always contain the crown of the tooth, although the tooth may be widely displaced from its point of origin. In the early stages there is no suggestive symptom other than the non-eruption of the tooth. Later, as the cyst grows, there may be expansion of the jaws, thinning the cortex sufficiently to produce a cracking sound when compressed because of the thin, parchment-like consistency of the cortical bone. Evidently the enamel function of the tooth germ has ceased, as the crown of the tooth is usually fully developed.

Treatment of all odontogenic cysts is surgical; the cyst is opened, the contents evacuated and the cyst wall curetted out. If a tooth is present, it must be removed in order to cure the condition. Likewise, if odontoma is present, the tumor must be removed.

Odontogenic Tumors. — Odontogenic tumors comprise those neoplasms arising from any portion of the tooth germ and histologically resembling either the mesodermal elements of the tooth root or the ectodermal elements of the enamel organ, or both.

Ameloblastoma (adamantinoma) was first described by Malassez in 1885. The word "adamantinoma" is a bit misleading, as there is no enamel formed in the tumor. More recently, the terms "adamantine epithelioma" and "ameloblastoma", which signify that the tumor arises from enamel organ epithelium, or the ameloblast, have come into common usage.

The oral epithelium normally has the potentiality of developing several different types of adult structures; namely, squamous cells, mucous glands, salivary tissue, tooth buds (enamel organs) thyroid tissue and Rathke's pouch of the hypophysis. Since the epithelium overlying the jaws and its several derivations all come from the same primitive epithelium, it is not uncommon to find all gradations of epithelial tumors, from ameloblastoma or adenocystic basal cell epithelioma, or salivary tissue, over to squamous cell carcinomas and other malignant growths. The clinical picture of many ameloblastomas, adenocystic basal cell epitheliomas, and salivary tissue tumors in the jaw itself are often similar. All of these tumors expand the jaw without ulceration, except after trauma or associated infection. The main clinical difference between adenocystic basal cell epithelioma on the one hand and ameloblastomas and salivary tissue tumors in the lower jaw on the other is that the former (adenocystic basal cell) often begins with pain. We have had 2 such cases of tumors in the lower jaws. There was expansion of the bone, with pain and irregular bone destruction visible in the roentgenogram. In both cases the mucosa healed after biopsy, a reaction not seen in the presence of squamous cell carcinoma. We have had several cases of adenocystic basal cell epithelioma of the upper jaw, in which pain was not a common symptom.

As the enamel differentiates in the process of tooth development, three types of epithelial tissue develop. The secreting cells next to the tooth become columnar; the outer layer of the enamel organ develops a rounded or oval epithelium, and the intervening cells become large, irregular and stellate. Histologically an ameloblastoma always has two or three of these types of epithelial structures.

There are five sources of origin commonly ascribed to ameloblastoma: (*1*) malformed and supernumerary tooth germs; (*2*) cells rests of the epithelial sheath of Hertwig; (*3*) odontogenic cysts; (*4*) surface epithelium, and (*5*) displaced oral epithelium in other parts of the body.

Clinical Behavior: The symptoms of ameloblastoma are usually insidious. There may or may not be a history of

injury. The most common symptom is a slow, painless expansion of the jaw without ulceration, at times continuing as long as fifteen or twenty years. Now that the dental and medical professions are on the alert for this tumor, patients with adamantinomas are coming earlier for treatment. Ameloblastoma should be thought of when the roentgenogram of any odontogenic cyst shows a moth-eaten or soap-bubble appearance along the edge, especially when the odontogenic cyst is multilocular.

Ameloblastomas are much more common in the mandible than in the maxilla. Expansion is usually lateral, the lingual side of the jaw remaining almost normal until the tumor becomes large. The tumor is usually irregular in shape and large, frequently cystic, areas develop, the walls of which often crepitate on palpation because of the thinned-out bone, giving a derby-hat crackle. The eruption or noneruption of teeth is not constant enough to be a diagnostic sign. If the ameloblastoma began in a dentigerous cyst, then the crown of the unerupted tooth will be found in one of the cysts. Many of the patients have had teeth removed for various reasons prior to coming to one of the clinics.

Pathologic Observations: Ameloblastomas vary markedly in appearance. The monocystic type apparently begins in a dentigerous or odontogenic cyst. The affected jaw is expanded to varying degrees, depending upon the size and shape of the tumor. The cortex may be compressed to paper thinness and may crackle under pressure. The bone may be completely destroyed, but the periosteum usually remains. The solid tissue has a whitish, granular appearance, smooth and shiny. Cysts of varying size and shape usually are scattered throughout the specimen and contain a clear, yellowish, fibrinous or mucoid (sometimes colloid) material, so that the ameloblastoma tissue may not be discovered until careful microscopic examination of the wall of the cyst is carried out.

Histologic Picture: The microscopic appearance of the ameloblastoma is variable. Since the tumors arise from tooth germ epithelium, the histologic structure may resemble any one of the many stages in the development of the ameloblast. Most ameloblastomas arise after cell differentiation into the two or three types of epithelium; the tumors then resemble the several stages of development. Various combinations occur, namely, cuboidal epithelium and stellate cells, or tall columnar epithelium and stellate cells; or perhaps in some areas all three types may be represented. Eight different histologic varieties are described:

1. Epithelioma type: The epithelial cells show very little tendency to differentiate and remain more or less basal.

2. Stellate type: The epithelial cells are predominantly stellate, as seen in the enamel organ.

3. Ameloblastic type: Lobes and follicles are present which are made up of cells found in the third stage of development of the tooth germ.

4. Acanthoma type: This variety contains squamous or prickle cells with a tendency to form epithelial pearls.

5. Ameloblastic carcinoma: In these there is definite resemblance to carcinoma with large sheets of squamous cells, not unlike those seen in squamous cell carcinoma arising from the oral epithelium.

6. Melanotic ameloblastoma: Here there are typical ameloblastoma cells; also epithelial cells containing pigment.

7. Hemangioadamantinoma: This is a rare type that shows a histologic picture of ameloblastoma with large blood spaces filled with red blood cells replacing the stroma and appearing to be lined by cylindric tumor cells.

8. Adenoameloblastoma: In these tumors the epithelium is differentiated into glandular structures and arrangement, still retaining to some extent the appearance of an adamantinoma.

Roentgen Examination: Roentgenograms are not sufficiently accurate to allow an absolute diagnosis of ameloblastoma in every case. Since ameloblastoma and cysts that arise from dental epithe-

lium have origin in the same embryologic anlage, the presence of ameloblastoma in an otherwise regular-walled dentigerous or follicular cyst should always be borne in mind. Large multilocular cysts of long standing are more apt to have ameloblastoma cells in their walls than are simple unilocular cysts. A small accessory cyst adjoining any odontogenic cyst should be looked upon with suspicion, as possibly containing ameloblastoma cells. Small areas of soap-bubble or honeycomb appearance or with a moth-eaten irregularity along the edge of the cyst, extending into the bone, are suggestive signs of ameloblastoma. Some ameloblastomas show no large cysts, but the whole involved area is made up of tiny cysts having the appearance of a mass of soap bubbles or a cross section of honeycomb. Teeth may be enclosed in one of the cysts or may be completely surrounded by tumor, or teeth may be displaced to a distance from their normal site. The roots of adjacent teeth may be denuded by pressure of the tumor, and there may be resorption of the surrounding alveolar bone. Central giant cell tumor and central myxofibroma are sometimes confused with ameloblastoma, as multilocular radiolucent areas are present with or without trabeculation, and because either of these two benign lesions may show irregularity of the cyst walls. Expansion of the jaw is more commonly associated with ameloblastoma than with myxofibroma or giant cell tumor. Ameloblastomas of short standing may not expand the jaw. Thoma has emphasized that myxofibromas have trabeculations that tend to form lines through the tumor instead of round compartments.

Prognosis: The outlook for most ameloblastomas is good, provided adequate and thorough treatment is given when the patient is seen early. Repeated curettage only serves to keep down the size of the growth and permits the patient to run the risk of malignant recurrences later. Smaller tumors not involving the entire depth of the jaw are resected intraorally with a wide margin of normal bone, giving a good cosmetic and functional result and also a good prognosis. Most of our patients have required radical operation, either because of the extent of the growth when first seen or because they have had repeated or conservative surgical treatment without permanent beneficial results.

Treatment: Our experience with patients having ameloblastoma treated conservatively over a period of years, plus those patients who have refused radical operation, has led us to believe that the best method of treatment is radical resection of the full thickness of the mandible with a margin of 1 cm. on each side of the growth, except in cases of small early tumors, in which a substantial portion of the lower edge of the bone can be saved, and leave a safe margin on all sides of the growth. This opinion is borne out by Simmons and by Ivy and Curtis. In most of our cases an extraoral approach has been required. The main objection of many surgeons and dentists to radical resection for ameloblastoma is based on the assumption that deformity and disfigurement result. These objections are outweighed by two facts: 1. Curettage and incomplete resection serve only to permit recurrences and run the risk, small as it may be, of malignant change in the recurrences. 2. Modern surgery, including bone grafting and the use of prosthetic appliances, reduces deformity and dysfunction to a minimum. Irradiation therapy has no place in the treatment of ameloblastoma.

Enameloma: These rare tumors are spoken of as enamel droplets or enamel pearls. They are found between the roots of two teeth and are more frequently attached at the bifurcation of the roots of molars and premolars, and at the cervical margin of single-rooted teeth (Thoma).

Roentgen examination shows an extremely radiopaque shadow without structure, the density being due to the hard enamel itself.

Odontoma: Odontoma is really a mixed tumor composed of ectodermal and mesodermal elements. Because these tumors form an intermediary group composed of

ectoderm and mesoderm, they will be discussed after epithelial tumors.

Tumors Arising from Oral Epithelium.—As has been stated, there are epithelial appendages (ameloblasts) in the jaw expressly for the purpose of forming tooth buds. Various tumors may arise from maldevelopment of the tooth buds which resemble epithelial structures not found normally in the jaws, such as adenocystic basal cell epithelioma, cylindroma-like carcinoma, squamous cell carcinoma and salivary mixed cell tumors. The latter are discussed under mixed tumors.

Central Adenocystic Basal Cell Epithelioma: In our 196 cases of jaw tumors reviewed, 6 showed adenocystic basal cell epithelioma. The patients' ages varied from 51 to 60. There were 5 men and 1 woman. The symptoms were pain, swelling and disability in all 6 cases. The duration of symptoms varied from one to four years. Previous treatment had consisted of extraction of teeth in 4 cases and conservative surgical measures in 6. The pain, rapid swelling and disability should make one suspect the presence of a malignant tumor. Differential diagnosis is sometimes difficult from a clinical and roentenologic point of view. Although these symptoms are present at times with ameloblastoma, the pain is neither so common nor so severe; disability appears late, and the swelling develops much more slowly in cases of ameloblastoma. Metastatic carcinoma can be fairly well ruled out by an adequate history, general physical examination and roentgen studies. Three of the tumors were located in the upper and 3 in the lower jaw.

The roentgenogram showed a characteristically moth-eaten, diffuse, destructive process throughout the bone. In 2 of the cases an early diagnosis of osteomyelitis was made. In 1 the presence of a sequestrum was suspected. In the other there was diffuse honeycomb formation in the bone. This honeycomb appearance was due to small cavities in the bone filled with tumor cells. Histologically the picture was that of basal cell epithelioma or cylindroma.

Treatment is radical operation, with resection of the lymph nodes in the neck followed by postoperative irradiation unless a very wide margin has been given. Two of the 6 patients lived one year; 3 lived three years, and the third could not be followed.

Central Squamous Cell Carcinoma: Since epithelial cells grow down into the jaw from the surface, it is not surprising that true squamous cell carcinoma is encountered in the jaw, possibly owing to metaplasia. Fortunately these tumors are rare. The presenting symptoms are pain and swelling with disability. The duration of symptoms is from one to two years. On examination ulceration and infiltration of the surrounding tissue are noted. The roentgenogram shows a radiolucent shadow with ragged edges and no new bone reaction. Treatment consists of radical operation with radical dissection of the neck. In our 2 cases of central squamous cell carcinoma the patients lived two and three years, respectively, after operation, and then both died of pneumonia.

Dermoid Cyst: Dermoid cyst of the mandible is apparently a rare occurrence, as we know of none reported in the literature and have observed only 1 in our own experience. The only symptom was a painless lump in the right mandible just inside the mouth, first noticed twenty-four years previously. There was gradual growth until a year prior to admission, when growth became more rapid. The roentgenogram showed a solitary radiolucent oval area with clear-cut regular edges and no new bone reaction. Treatment was operative removal. Recovery was uneventful.

Tumors of Peripheral Nerve Origin.—These tumors are rare. We have observed 1, similar to the tumor described by Lanford and Cohn in 1927 and by Cohn in 1928. The tumor occurred in a white boy aged 5 years and had been diagnosed previously as Ewing's tumor. It was resistant to irradiation. Subsequently radical resection was done, but the tumor promptly re-grew and did not respond notably to any further treatment. The patient died.

Histologically the tumor contained epitheloid glandular structures.

II. CENTRAL MIXED TUMORS

Central Mixed Tumors of Salivary Tissue.—The presence of these tumors in the jaw is theoretically due either to embryonic rests or to metaplasia of epithelial appendages. Most salivary tissue tumors in the mouth occur on the soft or hard palate, or along the gingival borders in the mucous membrane itself. Formerly this type of tumor was regarded as a carcinoma of the adenoma type. The tumor develops in the bone without subjective symptoms. Later there may be swelling of the cheek or face. Pain—neuralgic, burning or shooting—has been reported owing to involvement of the nerves or pressure against them.

Roentgenograms of central mixed tumors show a cystic region of varying outline. Coarse septa extend from the periphery into the tumor for a short distance and are likely to be variable in shape, often expanding irregularly instead of running out to a point. Calcified trabeculae may be found in the center, which are partly calcified connective tissue structures formed in the tumor itself (Thoma).

The histologic picture is that of a mixed cell tumor of salivary tissue; that is, there are varying components of glandular epithelial and connective tissue. Treatment is surgical. Mixed tumors of salivary tissue in the mouth, as elsewhere, are radioresistant.

Odontoma: This is often a mixed tumor composed of ectodermal and mesodermal elements. Strictly speaking (based on the classification given here, i.e., separation of all tumors according to their origin from ectoderm or mesoderm), odontomas should be divided into three groups: The simple ones, composed of only one dental tissue, mesoderm or ectoderm, and the mixed or composite variety composed of both. The results of roentgen study are of great importance because of the large amount of calcification in the tumor. Early discovery by roentgen examination allows prompt removal and may prevent occlusal disturbance later. The roentgen picture will vary according to the type of odontoma. There are very dense, irregular, mottled shadows, evidence of the various types and stages of tooth development. Such a tumor may or may not be cystic. Cystic odontomas can be differentiated from dentigerous cysts by the presence of poorly formed teeth; whereas in a dentigerous cyst the normal crown of a tooth is present. The histologic picture is that of a conglomeration of various types of tooth elements, mixed in orderly or disorderly fashion. Enamel, dentine, cementum, soft tissue (such as enamel epithelium) and peridontal tissue are found in the tumor.

Odontomas are benign and are excised by conservative surgical methods. Recurrences have not been reported.

III. TUMORS OF MESODERMAL ORIGIN: REACTION TO INJURY

Localized Osteitis Fibrosa With or Without Cysts.—Localized areas of painless swelling in the maxilla not caused by generalized disease (hyperparathyroidism) or derived from dental epithelium are not uncommon in the jaws. In these cases of localized osteitis fibrosa the levels of serum calcium and plasma phosphorus are normal. There is no generalized osteoporosis, and if cysts are present they do not have the epithelial lining observed in cysts of odontogenic origin. Geschickter and Copeland (1949) pointed out that the disease is probably preceded by a destructive process which becomes arrested or may progress without marked symptoms. At operation the bone-destructive phase is almost complete or has been replaced entirely by the healing stage. According to Thoma (1944), these occur in patients less than 21 years of age and more frequently under the age of 15 years. We have had several patients who are older, being in the third and fourth decade. In the older group there was a history of onset associated with the extraction of teeth. It is difficult to determine which came first, the swelling or the extraction of infected teeth. If the latter came first,

it would seem that in the older group osteitis fibrosa was due to an excessive reparative phase after infection. According to Geschickter, the more cellular growths occur in patients under the age of 20 years. He agrees that they may be associated with infection or trauma or may arise spontaneously. The clinical history is usually that of a painless but slowly increasing swelling of the upper and lower jaw. In our cases, the duration varied from a few months in the younger age group to four or five years in the older patient. The more cellular growths in the younger patients may be termed "ossifying fibromas". In the older group, the adult bone becomes more compact and may be classed as "osteomas" (Geschickter). The treatment is surgical removal. Recurrence is not uncommon, particularly if surgical removal has not extended beyond the pathologic process and included some of the normal surrounding bone. Cysts may or may not be present. When they are present, the term "osteitis fibrosa cystica" is usual. Roentgenograms depict expansion of the bone, with or without radiolucent areas (cysts). The density of the tumor in the bone, as seen in the roentgen film, varies between the density of normal cancellous bone and normal cortical bone. The fibrous tissue intervening between spicules makes the shadow less opaque than the solid cortical bone nearby. There appears to be more bone, however, in the tumor than in normal cancellous bone, and therefore the shadow is more opaque than areas of normal cancellous bone in the same film.

Traumatic Bone Cysts.—Etiologically, traumatic cysts are closely related to osteitis fibrosa cystica but deserve a special classification because of the different pathologic picture. In our 1 case the patient stated that she had fallen and displaced the right central and lateral incisors posteriorly several months prior to consultation. There was no particular swelling of the cheeks at that time. The swelling appeared rather suddenly while she was wearing an orthodontic brace and was noticed by her sister as they sat at the dinner table. There was no pain and no discoloration of the cheek. The patient was treated by incision of the cyst and permanent drainage. Gradually the cyst diminished, permitting complete removal of its lining. By degrees, after several years the asymmetry of the face disappeared as the normal side grew out to equal the affected side.

Pathogenesis: Thoma, who cited Schneider and Blum, expressed the opinion that these cysts are caused by trauma in soft bones where fracture does not occur. There is interosseous hemorrhage, sometimes extensive, due to the exceeding vascularity of the jaws. These cysts occur more commonly in the lower than in the upper jaw. The cortex is but rarely affected and generally not expanded. Roentgenograms show a cystic area of irregular outline. In our case the outline was fairly definite, with a well-defined edge. The roots of the teeth may be involved, so that a differential diagnosis from a radicular cyst must be made. Incision and curettage of the entire cyst wall, followed by packing with suitably medicated (e.g., iodoform gauze) stimulates granulation and healing.

Osteogenic Tumors.—Osteogenic tumors in the jaws resemble osteogenic tumors in other bones of the skeleton and are not common. Benign bone tumors are more frequently encountered than malignant bone tumors.

Benign Osteogenic Tumors: Hyperostosis is an enlargement of part or all of the mandible or the maxilla. Such hyperostosis occurs in Paget's disease, acromegaly and leontiasis ossea. In these diseases both jaws are usually affected. Local hyperostosis may occur unilaterally or may involve only a small portion of the maxilla or the mandible; it is thought by some to be due to inflammation or trauma. In most of our cases there has been a history of the removal of teeth at the time of onset of the swelling of the jaws. These swellings commonly grow to definite size and then stop. Pain is seldom present.

Exostoses and Enostoses: Exostoses are very common and occur most frequently

at the insertion of the muscles and tendons (Thoma) or at the junction of two bones, such as the palatal processes of the maxilla. To exostoses in this location the term torus palatinus is given. Torus mandibularis applies to exostoses on the mandible. It is important to differentiate these tumors from malignant growths. Roentgen examination reveals a radiopaque dense shadow in the middle of the palate or on the mandible (torus mandibularis).

Enostoses are hard bony tumors growing into the central portion of the jaw from the cortex. Thoma differentiated these from endosteoma by suggesting that in the former the tumor emerges imperceptibly into the surrounding spongiosa, whereas the latter are more likely to be demarcated by a connective tissue capsule, which is seen as a dark line separating the ingrowth from the spongiosa. In our series of bone tumors of the jaws all of these exostoses and enostoses were described as osteomas because of the histologic picture. In the roentgenograms, enostoses appear as dense, radiopaque shadows within the jaw.

Osteomas: Osteomas occur in the jaws, as in other bones of the skeleton. They may be peripheral or central; the latter are spoken of as endosteal osteoma.

As to their pathogenesis, Thoma has suggested that development may occur from any part of the maxilla or mandble and arises from preformed bone periosteum or retained cartilage cells from the embryonic chrondral skeleton. Clinical signs and symptoms of osteoma are due to mechanical changes caused by the size of the growth. Small ones may remain unnoticed for an indefinite period. Large osteomas cause marked disfigurement of the face. Osteomas are hard, circumscribed, and often irregular in shape, although they may be rounded and smooth. In our 196 cases of tumor of the jaws there were 17 osteomas, the patients varying in age from 11 to 60; 13 occurred in persons aged 31 to 50.

Treatment consists of surgical removal unless the tumor is asymptomatic. Large tumors cause some disfigurement and dysfunction. Prostheses or plastic repair, or both, may be required.

Fibrous Osteoma: This benign osteogenic tumor has been described under a number of terms: localized osteitis fibrosa, localized osteodystrophia, ossifying fibroma, fibrous osteoma, osteofibroma, hypertrophic localized osteitis and osteoid osteoma. The terms "osteitis fibrosa" and "hypertrophic localized osteitis" naturally imply the association of infection, or at least inflammation. There is little evidence to show that these conditions actually occur on an infectious basis. We prefer the term employed by Phemister and Grimson (1937), "fibrous osteoma", which indicates some localized bone disease related to tumor formation. In the opinion of these authors this type of growth is related to membranous preformed bone, as benign cartilage tumors and exostoses are related to cartilaginous preformed bone.

Histopathologic Picture: Microscopically, there is a mixture of fibrous tissue and new bone trabeculae.

Clinical Data: These tumors produce a varying degree of facial deformity, depending upon the location and size. In our series of 196 tumors of the jaws, 9 were diagnosed as fibrous osteoma. One occurred in a child under 10 years of age; 4 in persons between the ages of 11 and 20; 2 in persons between 21 and 40, and 2 in patients between 51 and 60.

Roentgen Data: In the roentgenogram there is an area of radiopacity of varying density, depending upon the amount of bone spicules scattered throughout the tumor. A larger amount of fibrosis lessens the radiopacity. There is no periosteal formation and no well-demarcated line at the edge of the growth. Some types contain well-defined cystic areas; to these the name of "osteitis fibrosa cystica" may be applied. The usual density in the roentgenogram lies between the density of cancellous bone and that of cortical bone.

Treatment: Fibrous osteomas involving the maxilla are treated by surgical intervention combined with intra-antral application of radium. This procedure was

suggested to us several years ago by Murray M. Copeland, who was working in our clinic at the time. Three of our patients have responded very well to this treatment. The antrum is opened through the mouth and radium tubes are inserted. An average dose of between 1,500 and 1,800 milligram hours is given. Local areas of osteitis fibrosa in the mandible are resected with a safe margin.

Chondroma and Osteochondroma: Cartilaginous tumors of the jaws are rare. They may be chondromas, osteochondromas, or occasionally rapidly-growing chondromyxosarcomas.

Clinical Behavior: The symptoms are pain, swelling and disability, depending upon the location.

Roentgen Data: On account of the small amount of tissue, true chondromas are usually radiolucent. The presence of bone tissue in the tumor casts a peculiar spotted shadow in the roentgenogram. There is absence of periosteal reaction.

Treatment: Surgical excision, including a zone of normal surrounding bone, is the treatment of choice.

Central Giant Cell Tumors: In our study of 196 cases of tumors of the jaws, 62 were diagnosed as giant cell epuli. Three of these were central and 59 were peripheral. Central giant cell tumors are uncommon in the jaws.

Pathogenesis: Geschickter and Copeland have shown that central giant cell tumors of the jaws are associated in their origin with areas of bone development through intermediary cartilaginous ossification. The giant cell tumors in the mandible also apparently arise from embryonic rests of Meckel's cartilage.

Histologic Picture: As in the giant cell peripheral epulis, these tumors viewed under the microscope are seen to be made up of multinucleated giant cells in a stroma of round and spindle-shaped cells. In 1 of our cases the giant cells seemed to spring from the endothelial lining of the blood vessels.

Clinical Signs: Central giant cell tumors grow more rapidly and destroy bone more extensively than do peripheral epulis. There is expansion of the bone to a thin shell. The mucous membrane may be discolored to a dark purplish hue, if the tumor is vascular; and most of these are vascular.

Roentgen Examination: The roentgenogram shows a central radiolucent single or multiloculated expansion of bone with a thin shell. Trabeculations vary in size and often extend throughout the tumor. Often it is difficult to differentiate between a giant cell tumor and a single or multilocular benign cyst.

Treatment of giant cell tumors is conservative. Electrosurgical removal often suffices to bring about a cure. Often it is possible to preserve teeth scattered near the tumor area, especially in young patients when the permanent teeth have not yet erupted. When the tumors extend into the temporal fossa or high into the maxilla, local removal should be followed by irradiation, as it is impossible to resect or destroy such extensive growths electrosurgically.

Malignant Osteogenic Tumors.—Osteogenic Sarcoma: Malignant bone tumors of the jaws are fortunately very rare, as evidenced by the fact that our 196 cases included 1 osteogenic sarcoma, 2 osteochondrosarcomas and 2 myxochondrosarcomas.

The clinical pictures of various forms of osteogenic sarcoma are similar—pain, swelling and disturbance in mastication, varying in duration from one month to two or three years.

The roentgen observations suggest the possibility of malignant tumor. The amount of radiopacity will depend on the amount of new bone laid down and the amount of bone destroyed. The radial spicules of bone laid down by osteogenic sarcoma (sun-ray effect) are not always present in osteogenic sarcomas of the jaws. The diagnosis is made by biopsy.

Treatment is very wide and extensive resection.

As to prognosis, the ultimate result in treatment of osteogenic sarcomas of the jaw is not good.

Connective Tissue Tumors. — Jaw

tumors of mesenchymal origin that are nonosteogenic include cementoblastomas, central fibroblastomas, both benign central fibromas and fibrosarcomas, fibromyxoma, central neurogenic tumors, central angiomas, Ewing's tumors, multiple myeloma, and eosinophilic granuloma. As the last three diseases are more or less general bone diseases, and as time and space are limited, their discussion in detail will be omitted from this work.

Cementoblastoma, Cementoma (Periapical Fibroma): These tumors are fairly common and are formed of a cellular stroma, the active and primary part of the neoplasm. Stafne (1934) has traced the development of cementomas from masses of connective tissue at the root ends of vital normal teeth as the result of proliferation of connective tissue of the peridontal membrane. These tumors are frequently multiple, remain rather indefinitely as a translucent area in the roentgenogram and may be confused with dental granulomas or cysts. When the diagnosis of cementoma is made, teeth may be saved; whereas they would be extracted if multiple granulomas or cysts were present. In most cases cementicles are formed in the connective tissue to such an extent that the cementum almost completely replaces it.

Roentgenographic examination is diagnostic; there are three stages, according to Thoma: (*1*) the osteolytic stage; (*2*) the cementoblastic stage, and (*3*) the mature inactive stage, when calcification is complete but there is still a thin dark area around it, indicating that the soft part is now merely a remnant of inactive tissue.

Treatment is surgical removal when the tumor becomes large. In most cases no treatment is indicated, for the tumors are slow in growing, becoming stationary and apparently remaining innocous for an indefinite period.

Fibroma (Central Fibroma): These tumors are rare. In our series of 196 cases there were 9 fibromas, 3 of which were centrally located.

Roentgenographic Data: The roentgen picture is that of a very diffuse, ill-defined lesion, with greater density than the surrounding bone. An odontogenic central fibroma, which usually has a cystic formation and is closely related to a tooth, must be differentiated from ordinary central fibroma.

Histologically, the tumor is characteristic of a fibroma containing fibroblasts and collogen fiber bundles.

Although the treatment of central fibroma is usually conservative, consisting of enucleated and chemical cauterization or electrosurgical treatment, one must be on the lookout for possible recurrences and later development of fibrosarcoma.

Fibromyxoma: Thoma classified these under true osteogenic tumors. If they develop from osteogenic tissue, they must arise from early embryonic cells still in the preskeletal form. Both of our patients were young women, 17 and 19 years of age.

Both complained of a painless swelling in the jaw.

Roentgenologically there was a large, multilocular, radiolucent shadow, involving most of the posterior third of the ramus, in 1 case extending beyond the midline anteriorly. There was some trabeculation, and a few areas suggested a honeycomb appearance, making it necessary to rule out ameloblastoma.

Under the microscope these tumors are found to be composed of stellate cells of long processes and other cells, triangular or cuneiform. These cells are contained in a mucoid matrix made up of fine fibrils, composing the delicate meshwork.

Treatment is local resection of the jaw, with a wide margin of safety. In both of our cases conservative treatment (curettage) was carried out first, but both tumors recurred, requiring resection of the jaw. In 1 the resection was done subperiosteally, and in three months enough bone had regenerated to make the jaw solid. The patient wears a prosthesis. In the other the recurrence was complicated by secondary infection and the bone had

expanded to such an extent that resection of the periosteum was necessary. A subsequent bone graft gave a good result. At the time of writing both of these girls are married; 1 is now a mother.

Central Fibrosarcoma: Under this heading are included fibrosarcomas of nonosteogenic origin which are of the fibro-spindle cell type. These tumors are rare but should be borne in mind in the differential diagnosis of malignant central tumors of the jaw. These tumors also are to be differentiated from peripheral fibrosarcoma invading the bone from without.

The symptoms are pain and swelling in the affected part, with corresponding disfigurement and dysfunction.

Roentgenographically the tumor is osteolytic in its action and produces a radiolucent area which, on account of its infiltrating character, possesses an indistinct margin. The cortex may be destroyed when the tumor is sufficiently large and without evidence of periosteal activity, as in osteogenic sarcoma.

Histologically the tumor cells are spindle-shaped or oat-shaped, and in some cases may acquire considerable cytoplasm.

The treatment is radical dissection of the jaw, with a wide margin of surrounding soft parts.

Neurogenic Fibrosarcoma: These tumors, like the fibrosarcomas just described, are rare and may simulate histologically the various types of neurogenic fibrosarcoma.

The clinical and roentgenologic features are similar to those described for fibrosarcoma.

The treatment is radical resection of the jaw and adjacent soft parts.

Central Angioma: This is a rare tumor and is to be distinguished from angioma of the vessels of the periosteum or the oral mucous membrane which invade the outer surfaces of the jaws. The central aniomas form in the marrow or spongiosa.

The symptoms are not particularly characteristic. The tumors are slow in development and are benign. A few have been reported as developing rapidly. Pain is a frequent symptom and may be pulsating. Large tumors expand the bone, causing facial disfigurement.

Roentgen examination reveals small multilocular radiolucent areas resembling the so-called "soap bubble" effect. The bone is expanded in a manner similar to that associated with giant cell tumors. There is a fine fibrillar network within the cystic cavities.

The histologic picture is that of cavernous or capillary angioma.

The treatment is ligation of the major artery or arteries supplying the tumor. Preoperative and postoperative roentgen therapy has been used to sclerose the blood vessels.

Odontogenic Mesenchymal Tumors.—Soft Odontoma: The soft odontoma may be of a mesenchymal origin alone, without evidence of dental epithelium. The signs and symptoms have been described.

Benign Giant Cell Tumors.—These tumors may be peripheral, when they are often called epulis and central giant cell tumors. The latter have been described.

Giant Cell Epulis or Peripheral Giant Cell Tumor: These tumors appear most frequently in children and young adults between 10 and 20 years of age or during the period of eruption of the permanent teeth, and usually they occur near the canine, bicuspid or incisor teeth and also about the roots of those permanent teeth which are preceded by deciduous dentition (Geschickter, 1935). These growths are to be distinguished from so-called "fibrous epulis" and peripheral fibroma. The former are really sclerosed granulomas; the latter are true tumors. Giant cell epulis arises from pericementum or alveolar dental periosteum. They are related to the normal proliferation of odontoclasts occurring in the cementum about the roots of the deciduous teeth.

Under the microscope the tumors are seen to be made up of many multinucleated giant cells in a dense fibrous stroma. There is no inflammatory reaction. In 1 of our cases the giant cell tumors appeared to come from the endothelial lining of the blood vessels.

Clinically there is localized swelling without other symptoms. The tumor is soft, sessile or pedunculated, and deep red or mottled. It bleeds on slight trauma.

Roentgenographically there is no invasion of bone, but the bone may be destroyed by pressure, leaving smooth, lobulated, radiolucent areas.

The treatment is wide surgical excision with chemical or thermal cauterization. In our hands electrosurgical removal, with electrodesiccation or mild electrocoagulation of the base, suffices to cure. Occasionally we have applied radium after electrosurgical removal. Curtis Burnam (personal communication) held that these tumors were quite radiosensitive. Kazanjian has said that giant cell epuli are highly resistant to irradiation. It is our opinion that electrosurgical removal is preferable to irradiation, as there is less damage to underlying bone and less likelihood of late destruction of the teeth from obliterating endarteritis.

IV. MALIGNANT TUMORS METASTATIC TO THE JAWS

Secondary involvement of the jaws from malignant disease elsewhere in the body is not common. The diagnosis of such metastasis must be made by the exclusion of primary jaw tumors, confirmed by a careful search for a primary focus and then substantiated by histologic examination. Carcinoma metastatic from lip, breast, lung, prostate gland, stomach, thyroid gland, hypernephroma, adrenal gland, etc., has been reported.

Clinically the symptoms are those of any other malignant tumor of the jaws. There may be rheumatoid pain and other neurologic manifestations, due to pressure on the nerves within the jaws. Systemic symptoms due to the primary focus develop sooner or later.

The roentgen picture is that of other malignant neoplasms of the jaws. Radiolucent areas may be irregular in shape, owing to invasion of the bone. The amount of destruction depends upon the disease process.

Treatment is palliative and symtomatic.

SUMMARY

The authors present an exhaustive study of tumors of the jaws, classified into (1) ectodermal tumors primary in the jaws, (2) central mixed tumors, (3) tumors of mesodermal origin and (4) malignant tumors metastatic to the jaws. The roentgen characteristics of all types are discussed and the treatment outlined.

ZUSAMMENFASSUNG

Die Arbeit besteht aus zwei Teilen und gibs eine erschoepfende Eroerterung und Analyse der klinischen Aspekte von 534 Faellen von Kiefergeschwuelsten. Der erste Teil beschaeftigt sich mit den beiden Hauptformen der primaeren Kiefergeschwuelste, naemlich den von Ektoderm und den vom Mesoderm entspringenden. Der zweite Teil ist der Untersuchung der weniger haeufigen Form, der Michgeschwulst, gewidmet, die sowohl ektodermale als auch mesodermale Elemente aufweist. Erwaehnt werden auch die nicht haeufigen aber doch gelegentlich auftretenden metastatischen Geschwuelste, die in Faellen von Karzinom oder Sarkom in anderen Koerpergegenden beobachtet werden. In diese letzte Gruppe sind gutartige und boesartige Geschwuelste, die in die Kiefer von angrenzenden Geweben eindringen, eingeschlossen. Diese Kategorie zerfaellt in Unterabteilungen, die fast alle im Kiefer vorkommenden Geschwuelste umfassen.

RÉSUMÉ

Ce rapport très complet de 534 cas de tumeur de la mâchoire, comporte deux parties; une discussion et une analyse des aspects cliniques de cette lésion. La première partie de la discussion se rapporte à deux types de tumeurs primitives de la mâchoire, celles naissant de l'ectoderme et celles des mésodermes. Le seconde partie du travail s'applique surtout à l'étude d'un type de tumeur moins fréquent, la tumeur mixte, qui présente des

éléments ecto et mésodermiques. Même si l'évidence est rare, il est fait mention de cette tumeur occasionnelle métastatique amorcée à un sarcôme ou à un carcinôme situe ailleurs dans l'organisme. Cette dernière classification comprend les tumeurs bénignes et las tumeurs malignes qui envahissent la mâchoire par propagation des tissus mous avoisinants. Cette classification est détaillée davantage afinde permettre d'y inclure tous les types possibles de néoplasme que l'on peut rencontrer dans la mâchoire.

RIASSUNTO

Questa e' una discussione esuaribile a due parte ed analisi degl'aspetti clinici di 534 casi di tumori delle mascelle. La prima porzione della discussione e' consegnata a due tipi principali di tumori primarii delle mascelle, cioe', quelli derivati dell ectoderma e quelli del mesoderma. La seconda parte della ricerca esamina un tipo meno comune, tumore misto, che ha entrambi elementi ectodermali e mesodermali. Benche' non sia comune, si fa menzione del tumore metastatico occasionale associato con carcinoma o sarcoma altrove nel corpo. Questa classificazione tardiva include tumori benigni o maligini che invadono le mascelle da tessuto molle adiacente. La categoria e ancora distrutto per includere quasi tutti tipi di neoplasmi alla quale la mascelle e' suscettibile.

RESUMEN

Se discuten y analizan los aspectos clínicos de 534 casos de tumor de los maxilares. Se dedica la primera parte de la discusión a los dos tipos principales de tumores primarios de los maxilares, es decir, los ectodérmicos y los mesodérmicos. Se examina en la segunda parte un tipo menos común, el tumor mixto, que tiene tanto elementos ectodérmicos como mesodérmicos. Aun cuando no es común, se hace alguna mención del tumor metastásico ocasional asociado con carcinoma o sarcoma en otra parte del cuerpo. Esta última clasificación incluye tumores benignos o malignos que invaden los maxilares del tejido blando adyacente. Además, se trata de incluir en la categoría casi todo tipo de neoplasma del cual sea susceptible el maxilar.

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Etiology of Strictures Occurring After Prostatic Operations

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THE objectives of the surgical treatment of prostatism are to remove the urinary obstruction as safely as possible and to restore a urethral channel that will function properly and permanently. Modern technics, improved anesthesia, adequate blood banks, a better understanding of fluid balance and the rational use of antibiotics have lowered the mortality statistics of prostatic surgery to the almost irreducible minimum obtained with other major operations on patients in a similar age group. There is, however, need for further improvement in the completeness and permanence of functional results.[1]

Last year we appraised the end results of prostatic operations urethrocystographically and demonstrated that this roentgen method of examination was easily executed, was free of complications and produced important diagnostic information that often was unobtainable by other means. The various structural deformities following prostatectomy were graphically portrayed and permanently recorded. Many latent lesions of the urethra, vesical neck and prostatic bed were found to occur particularly in patients with persistent postoperative symptoms. The report, which was based on the results of more than 300 roentgenographic examinations of patients who had had every kind of prostatic operation, concluded that urethral strictures form after every type of prostatectomy and that these strictures are the most frequent feature of the unsatisfactory functional result. The postoperative strictures in this group were catalogued on the basis of their location and their causes, and the present paper is the result of our clinical and roentgenographic studies.

This report is not statistical, and the strictures visualized here are incidental to a large series of prostatectomies extending over twenty years. In many cases the patient's condition was the unfortunate result of urologic treatment elsewhere, and he had gravitated to our clinic in search of relief.

The indications and contraindications, the opaque media, and the urethrographic technic, which employed a specially designed urethrographic instrument, have been previously reported.[2] The roentgenologic anatomy of the urethra and the urethrographic observations in the presence of prostatism, including a classification of prostatic obstruction, have also been previously described.[3]

The presence of strictures after operation is a source of embarrassment to the urologist, and every effort should be made to establish the nonexistence of such strictures prior to surgical intervention. Strictures, especially those resulting from infection, sometimes take years to develop, and the connective tissue replacement of the urethral linings may have been present long before the advent of prostatism. The ultimate contraction of these scars cannot be avoided. The urologic adage that stricture and prostatic enlargement do not occur in combination is a fallacy. André[4] found that 4 per cent of a series of 300 patients with prostatic hypertrophy had urethral strictures with a caliber less than 18F. A preoperative urethrogram will disclose their presence and

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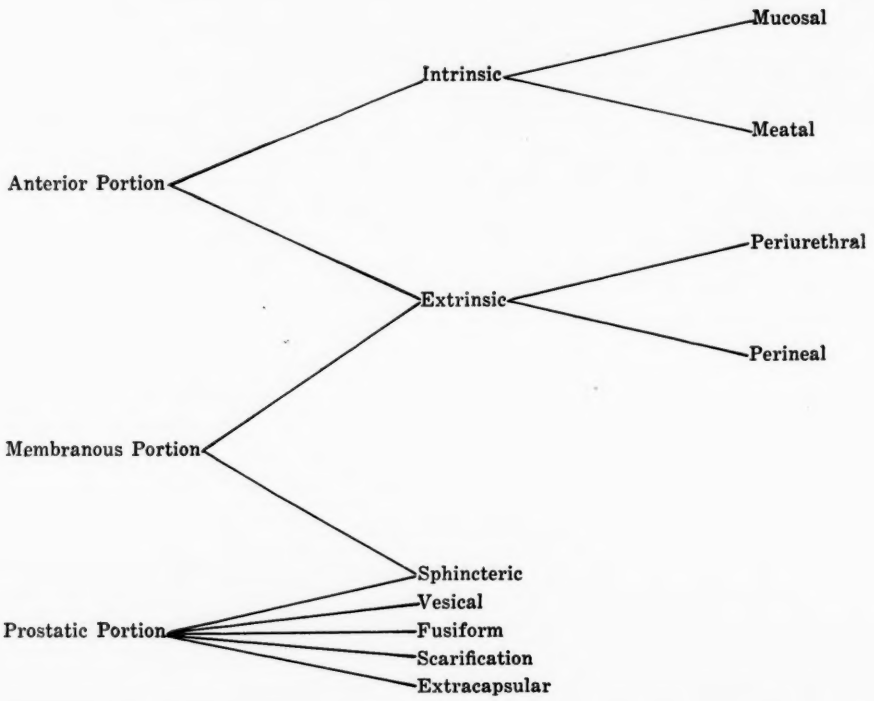
CHART 1.—*Postprostatectomic Urethral Strictures (Urethrocystographic Classification)*



also demonstrate prostatic obstruction (Fig. 1). The relation of symptoms to the stricture should be evaluated and the patient told of the need of periodic and continuous urethral dilatations after prostatectomy.

There are various methods of classifying urethral strictures, but for the sake of conciseness and clearness we are using only two criteria for presenting this postoperative group. The first classification is anatomic and is based on the roentgen changes on the urethrogram. The second group is clinical and is based on the etiologic factors.

Urethrocystographic study will delineate the number, character and length, as well as the sites, of the postoperative strictures. We have used the latter factor as the basis of classification, since it is the most important from the functional standpoint. Postoperative strictures may be multiple and frequently coexist with other abnormalities (Fig. 2).

STRICTURES OF THE ANTERIOR URETHRA

Constrictions in the anterior urethra may be intrinsic and due to actual pathologic changes in the walls of the canal, or may be extrinsic and secondary to external scar contracture.

Intrinsic.—Mucosal: Overdilatation of a normal urethral canal of small caliber, inadequate lubrication and the rough and frequent passage of instruments often traumatizes the delicate mucosa sufficiently to produce strictures. The resulting

sclerosis causes loss of elasticity in the involved areas of the urethral wall and appears on the urethrogram as pronounced narrowings which may encircle the urethral channel, or as notches which may involve only part of the urethral circumference. Comparison of the postoperative with the preoperative urethrogram will often show irregularity of the outline and marked diminution in the width of the anterior urethra. This may be limited to only a portion of the urethra or may extend throughout its length (Fig. 3).

Meatal: The urethral meatus is an anatomic area which is often overlooked; dribbling and narrowing and forking of the stream are frequently due to strictures in this area. The scarified meatus has occasionally contracted to such an extent that it is difficult to insert the meatal tip for urethrographic procedures.

Extrinsic.—Periurethral: External scar formation can surround the urethra and produce narrowing of the canal. The bulbous and bulbomembranous urethra are the regions most susceptible to damage by instruments and are frequent sites of periurethritis and stricture. Instrumentation injures the superficial tissues sufficiently so that hydrodynamic pressure forces fluids into the surrounding tissues and sets up periurethral infection. Residual scar tissue remains after drainage of the abscess and leads to eventual stricture (Fig. 4).

Perineal: Marked infection or urinary irritation of the tissues of the perineum following prostatectomy leaves extensive scarification which frequently involves the exterior of the membranous urethra. This is especially prone to occur when the pathologic condition is in the deep perineal compartment. The fibrous tissue eventually contracts and constricts the canal. Distally, a portion of the bulbous urethra may be involved; proximally, the external sphincter may be fixed by scar and its efficiency thereby affected (Fig. 5).

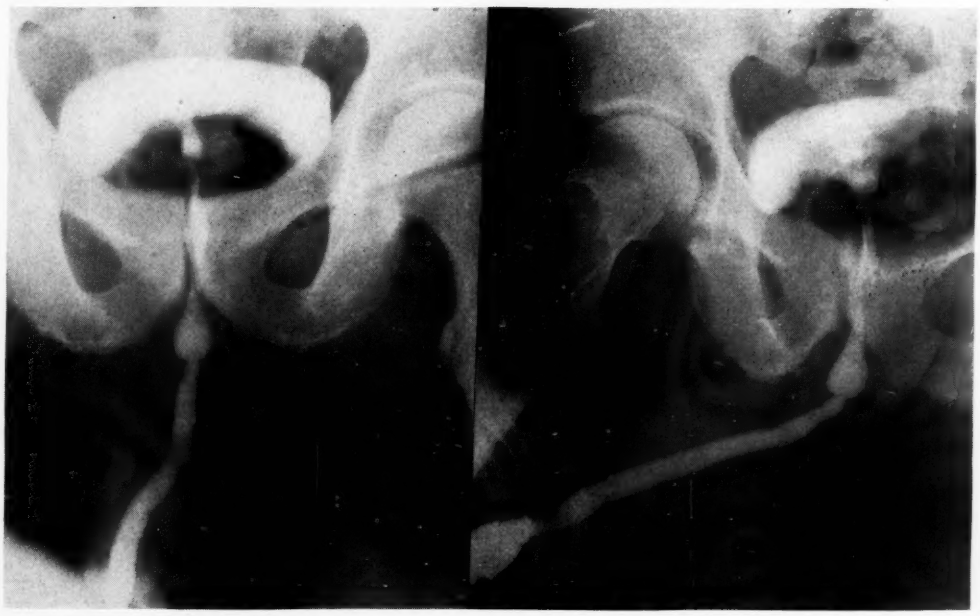


Fig. 1.—Hypertrophied prostate and urethral stricture. L. S., aged 53, with a history of urethritis thirty years ago. No treatment administered for strictures. The patient had symptoms of prostatism for one year. Note the marked elevation of the bladder base and the constrictions in the bulbous portion of the urethra.

STRICTURES OF THE MEMBRANOUS URETHRA

Strictures are seldom limited to this area but extend either distally to the anterior urethra or proximally to the prostatic urethra. On the retrograde urethrogram, the normal truncated shape of the membranous urethra is replaced by a narrow straightened canal with a notched outline. On the voiding urethrogram this area is fixed and fails to distend in a normal manner.

STRICTURES OF THE PROSTATIC URETHRA

Strictures of the prostatic bed (Fig. 6) may be classified into the following types:

A. Sphincteric. — The infracollicular portion of the urethra contains constricting scar tissue which may cause a short circular stricture or may be elongated and extend through the external sphincter to the membranous and, in some cases, the bulbous urethra (Fig. 7).

B. Vesical.—Fibrosis at the vesical neck is not a rare sequela after prostatectomy. Strictures in this area are apt to interfere with the efficiency of the internal sphincter and cause many marked symptoms (Fig. 8).

C. Fusiform.—This is a combination of types *A* and *B* in the same patient (Fig. 9).

D. Scarification.—Fibrosis and stricturing of a major portion of the prostatic urethra have been observed after wide fulguration in persistent infection and following prolonged hemostatic bagging or packing (Fig. 10). On the voiding urethrogram, the base of the bladder does

Fig. 2.—Multiple urethral strictures. L. W., aged 79. In April, 1948, the patient had a transurethral prostatectomy performed at a New York clinic. Symptoms of prostatism persisted. Pain also developed in the penis and penoscrotal angle. Note the strictures: (*1*) of the membranous urethra; (*2*) of the penile urethra, and (*3*) in the navicular urethra.

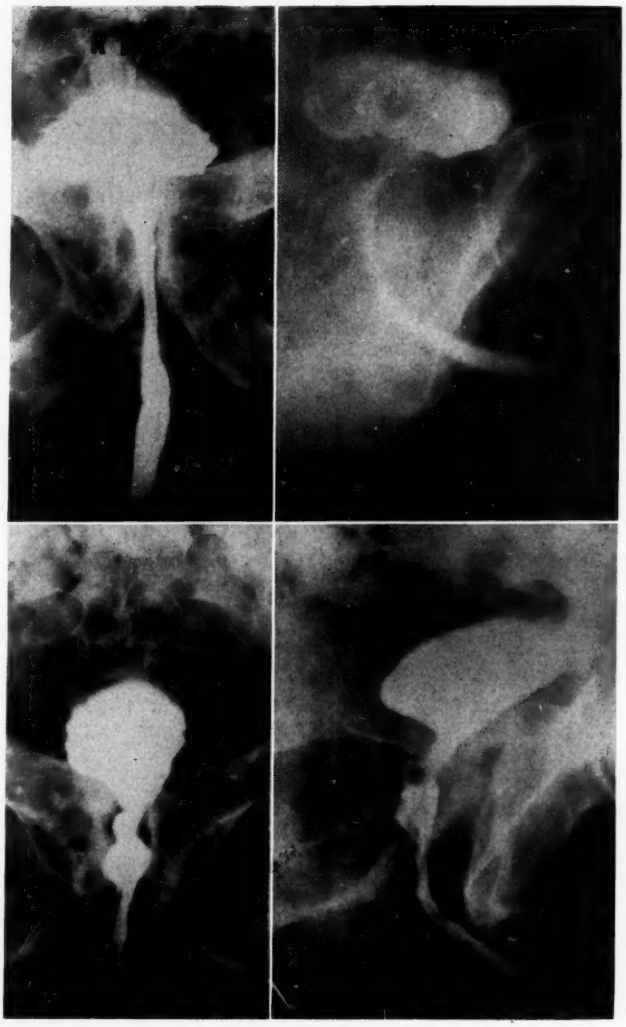


Fig. 3—Comparative roentgenograms, preoperative and postoperative, of R. T., aged 55. Above, anteroposterior and oblique views prior to transurethral resection. Below, two views showing the status of the same canal taken from the same views one year later. Note the narrowing throughout the anterior urethra on the postoperative urethrograms.

not descend on straining but remains fixed, and the vesical neck does not dilate but remains rigid and narrow.

E. Extracapsular.—Perforation of the prostatic capsule, undermining of the trigone, and resection through the bladder neck fibers are occasional complications of prostatectomy. These lesions may respond satisfactorily to appropriate emergency treatment which prevents exodus but often leaves sequelae in the form of stricture and massive scarification.

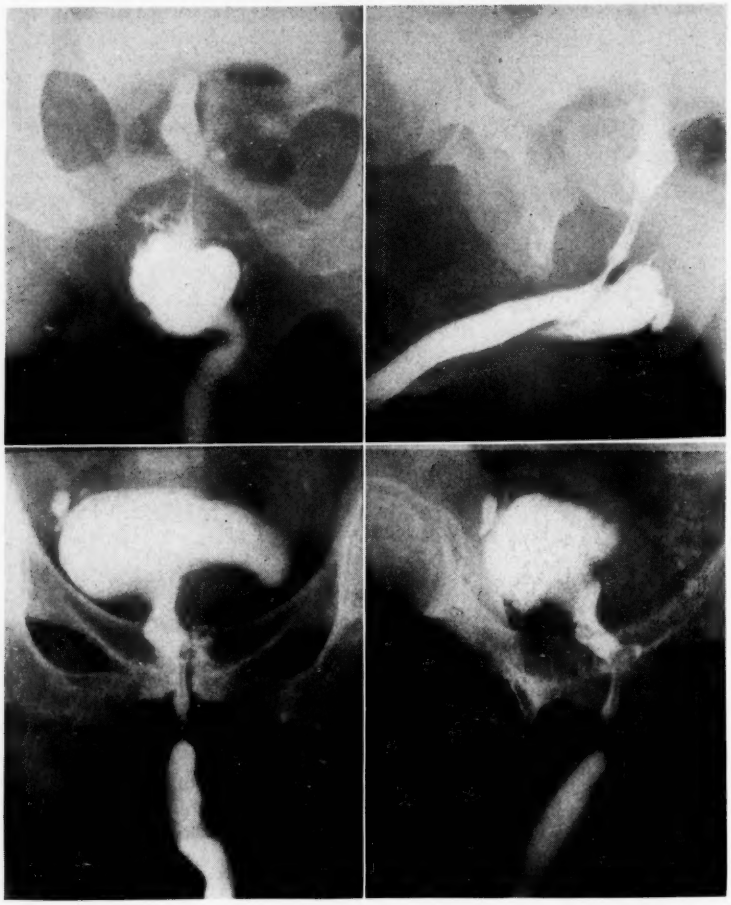


Fig. 4—Extrinsic periurethral stricture. M. N., aged 64. Above, two urethrograms taken March 7, 1946, six months after a suprapubic prostatectomy. Note the urethrovenous reflux and the periurethral extravasation of the opaque medium in the region of the bulbous urethra. Below, urethrograms taken March 17, 1950. Note the strictures now prominent in the bulbous area.

Very often dysfunctions following prostatectomy are not dependent on the degree of technical perfection at the time of operation, the dexterity of the surgeon or even the choice of operation, but are due rather to the neglect of certain surgical principles which were recognized by our urologic predecessors and which today, in spite of the new armamentarium, maintain their importance. Some of these axioms are reactivated and stressed in the following classification.

INFECTION

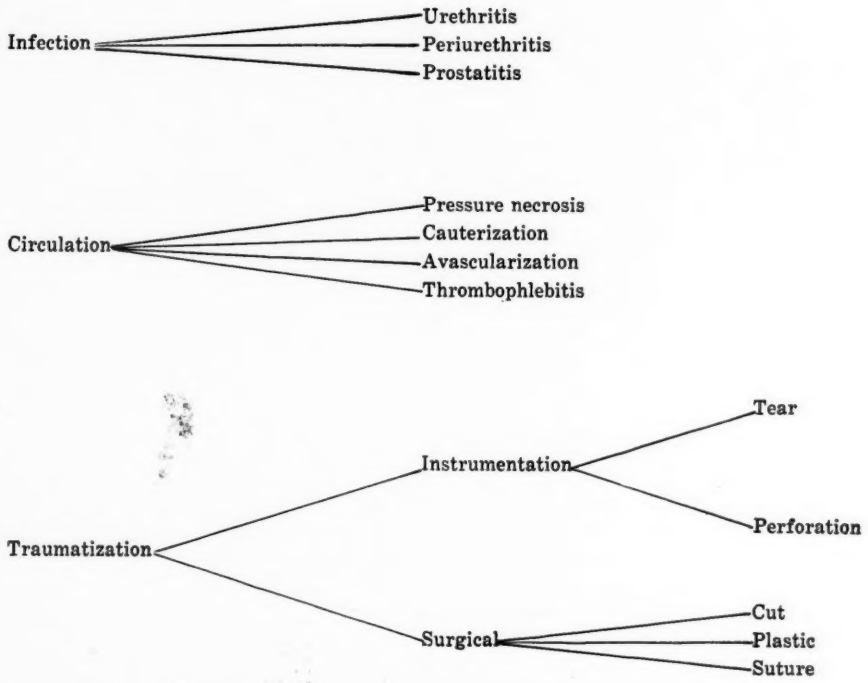
Urethritis.—The avoidance of urethral drainage prior to prostatectomy is desirable when possible. The occurrence of severe urethritis during the bladder drainage period often results in strictures. Some urethral infections persist in the presence of a catheter in spite of chemotherapy. Suprapubic drainage is preferable to the indwelling urethral catheter when prolonged vesical drainage is re-

quired. Frequent catheterization should be avoided if possible. With bleeding from a congested prostate in one patient who developed strictures after operation, there was a history of 6 changings of the urethral catheter because of obstruction by small blood clots prior to surgical intervention. The diabetic patient is especially susceptible to urethritis and requires special attention. In 1 such patient the infection became so severe that there was actual sloughing of pieces of the urethral mucosa. Expert and continuous control of the diabetic situation is advisable for all diabetic patients who undergo prostatectomy.

The presence of severe anterior urethritis during convalescence and its persistence after prostatic operations may lead to stricture formation. The mucosa becomes edematous, and inflammatory exudates form in the submucosal tissues, which become organized and eventually are replaced by varying amounts of scar tissue. The urethral canal loses its distensibility according to the degree of sclerotic infiltration. On the urethrogram, a wavy outline and a diminution of the size of the lumen are noted. In those patients in whom the process continues the sclerosis results in hard infiltrations, which appear as multiple constrictions.

Meatitis may develop from placing too large a catheter in too small a urethral canal. This is sometimes done preoperatively, especially if hematuria is present, in an attempt to obtain as large a caliber as possible for drainage of clots. There should be sufficient space between the catheter and the urethral mucous mem-

CHART 2.—*Postprostatectomic Urethral Strictures (Etiologic Classification)*



brane to permit drainage of urethral discharge. Constricting adhesive tape is to be avoided. Pressure of the mucosa against the catheter interferes with the circulation, causing necrosis and subsequent scar tissue replacement. This sometimes can involve large areas of the urethra. The diabetic patient is especially susceptible to this condition. The use of plastic catheters may be of some value in preventing urethral infection and irritation and may help to diminish the incidence of this complication. Adequate urethral meatotomy prior to catheterization in a patient with a small meatus will minimize the incidence of this.

Periurethritis. — The urethral glands (glands of Littré) are involved by infection during the course of urethritis. If there is sufficient drainage between the orifice of the gland and the catheter, the infection may be self-limiting. If the orifice of the urethral gland is obstructed and there is no room for drainage, the infection backs up and breaks through the confines of the gland, invades the surrounding tissues, and produces a periurethral abscess.

Prostatitis.—In the ideal case, after prostatectomy, the urine clears and the prostatic bed becomes re-covered with mucosa within a few weeks. Chronic in-

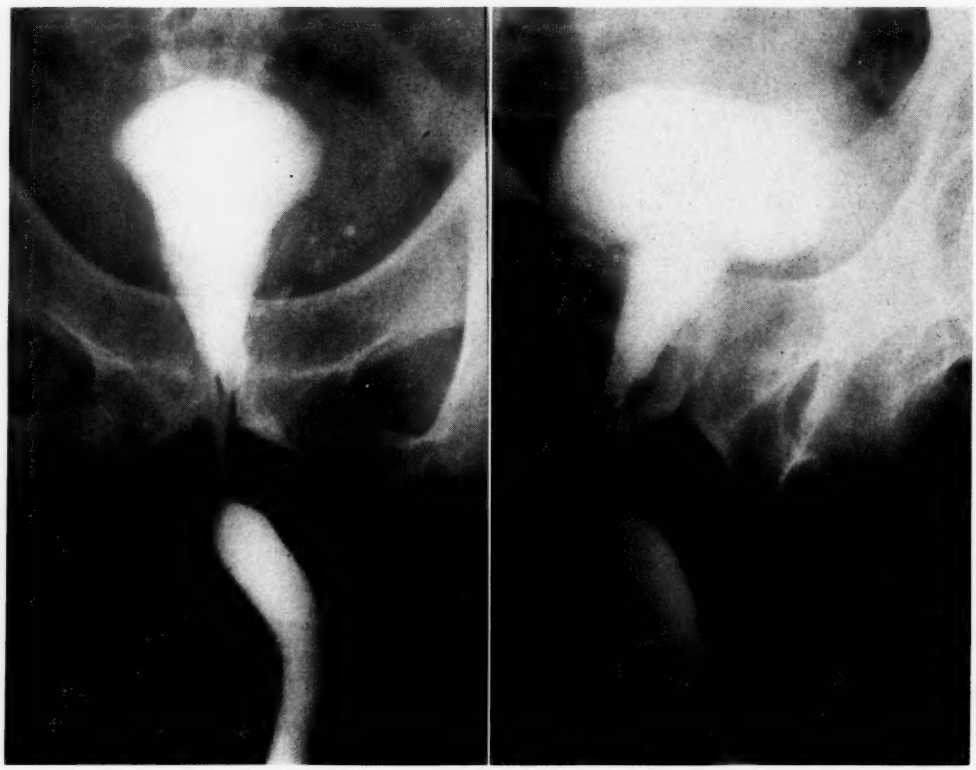


Fig. 5.—Extrinsic perineal stricture. A. P., aged 83, taken in 1942 at a west coast clinic following perineal prostatectomy. The urinary sediment was loaded with pus. Persistent frequency and nocturia occurred every hour. Difficulty arose in passing a No. 16F catheter. A small stone was found in the bladder. The narrowing of the entire membranous urethra is probably due to external scar formation in the perineum. Note that the prostatic urethra has failed to involute and that, although there is an elongated stricture, its walls are relatively smooth.

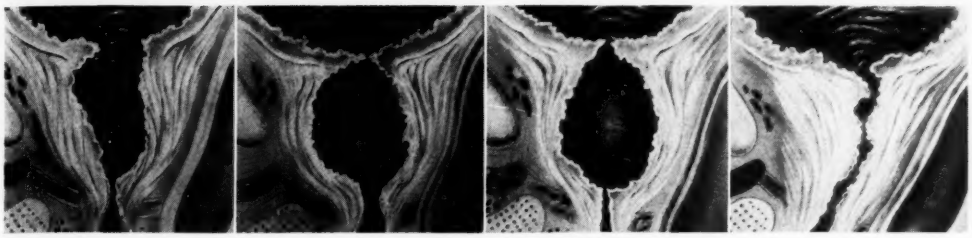


Fig. 6.—Strictures of the prostatic bed. *A*, sphincteric stricture (case of H. R., Fig. 7). *B*, vesical stricture (case of G. L., Fig. 8). *C*, fusiform stricture (case of A. B., Fig. 9). *D*, scarification stricture (case of C. W., Fig. 10).

fection in this area delays the regrowth of the mucosa and increases the amount of fibrous tissue. Incomplete removal of the prostate is a common cause of persistent infection. The adenomatous tissue defies clearing of the infection and leads to a proliferation of the fibrous tissue. The prostatic cavity involutes irregularly and remains distorted by the unequal contraction of the scar tissue. This may interfere with proper closure of the vesical neck and is often the cause of dribbling.

The avoidance of contamination, the institution of adequate drainage in and around catheters and the use of chemotherapeutic agents which are indicated for the specific type of organism will minimize the incidence of strictures due to infection.

CIRCULATION

Pressure Necrosis. — The interference with the blood supply to tissue results in ischemia, death of the cells and their eventual replacement by fibrous tissue. The use of packs, bags and a hemostatic catheter under extreme pressure for extended periods is a common cause of strictures, especially in the region of the membranous urethra.

Cauterization. — Millin[5] recommended the use of the electrocautery to secure hemostasis in the retropubic prostatectomy. Extensive cauterization is undoubtedly a cause of stricture formation. Professor Alfonso de la Peña of Madrid, in a personal communication, mentioned having noted a marked diminution of stricture formation in his retropubic prostatectomies after he stopped using the electrocautery. There is a tendency to overcauterize in transurethral control of hemorrhage from the prostatic bed. Those patients who were treated either for transurethral prostatectomy or by open operation and developed delayed hemorrhage requiring secondary cauterization were likely to develop strictures. Undoubtedly, there is also definite hazard in passing a large resectoscope through a urethra that may still be edematous and infected. Transurethral resections increase the incidence of strictures, as has been noted by many observers. Strictures in the membranous portion of the urethra after transurethral surgical maneuvers follow direct injury by the electric loop, which produces a coagulated surface of devitalized tissue, or indirect injury due to pressure of the resectoscope when the triangular ligament is used as a fulcrum. In 1 patient a narrow inelastic canal developed in an elongated portion of the urethra after an unsatisfactory resection. The sclerosis may have been due to heat in the instrument secondary to a short circuit.

Avascularization.—Avascularization in the prostatic bed is a common cause of stricture formation and is apt to occur after transurethral prostatotomy in which there is incomplete removal of adenomatous tissue and in which large sections may be deprived of their blood supply. Total resection down to the capsule is a difficult operation. Residual prostatic tabs and remnants of devitalized

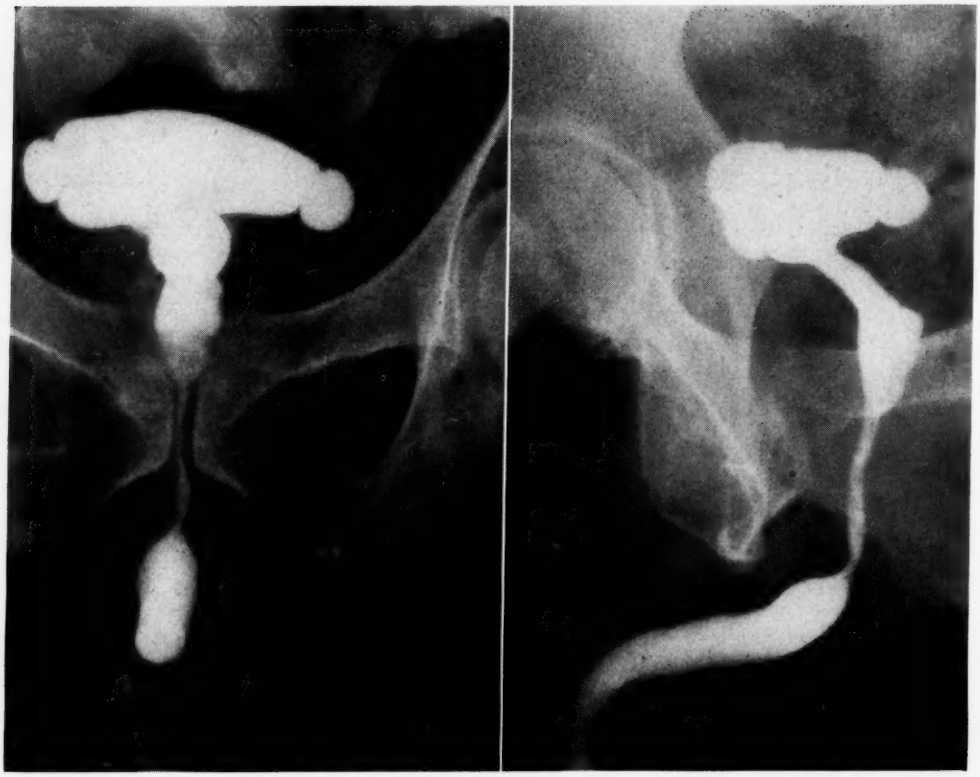


Fig. 7.—Sphincteric stricture of the prostatic bed. H. R., aged 73. On Aug. 30, 1946, a supra-pubic prostatectomy was performed, the removed specimen weighing 19 Gm. On October 17 the patient was examined for dribbling when walking. A urethrogram was taken and the urethra dilated to the caliber of a No. 24F sound. On December 13 the patient voided (q 2-3 hours). There was nocturia (2×), with no dribbling. On Feb. 19, 1948, the patient had difficulty in voiding. The stream was narrow. Pyuria was persistent. The filiform stricture of the membranous urethra was dilated.

tissue act as foci of chronic infection and cause proliferation of fibrous tissue.[6]

Thrombophlebitis.—Strictures often follow trauma to the corpus spongiosum and are due to localized thrombophlebitis or a vascular thrombosis. Organization of a hematoma causes fibrosis and eventual constriction.

TRAUMATIZATION

Stricture secondary to trauma tends to rapid formation of dense cicatricial tissue and constriction early, in contrast to those due to infection.

Instrumentation.—Many patients with prostatism, especially those who develop sudden acute retention, often have their first catheterization done by a physician who is not a urologist. Ability and experience in catheterization varies, and patients are still seen with blood pouring from the urethra after injudicious instrumentation. Undoubtedly, the urethral mucosa and even the deep urethral tissues have been badly traumatized. In these patients, strictures eventually develop which are not related to the actual operative technic. Their origin often puzzles the surgeon.

Even in experienced hands catheterization may be difficult, and protracted efforts will result in urethral trauma. It

probably is wise in these cases to resort directly to cystotomy to drain the bladder.

Surgical.—Incision: Strictures of the prostatic urethra in the region of the verumontanum extending to the membranous urethra occur with the suprapubic or retropubic approach if the apex of the gland is improperly divided during enucleation. Sharply cutting across this area rather than risking tearing a portion of the urethral mucosa is advisable.

Plastic Operations on the Vesical Neck: Bitschai and Axler[7] have called attention to the ineffectiveness of plastic procedures in preventing postoperative contractures of the vesical neck. They noted that, despite such technics as the Thompson-Walker posterior V-flap excision, Albarran's incision of the posterior lip of the bladder neck and Harris' posterior stitch technic, contracture may still occur. They expressed the opinion that proliferation of fibrous tissue was secondary to infection of the prostatic bed. Wilhelm and Freed[8] reported 9 cases of stricture of the bladder neck in a series of 33 consecutive retropubic prostatectomies. This complication occurred despite the fact that a V-shaped wedge was excised from the posterior lip of the vesical neck.

Sutures: Sutures were probably the cause of strictures in some of our retropubic prostatectomies. Two or 3 sutures were usually placed into the capsule and tied in position. These sutures must undoubtedly have deprived some of the cap-

Fig. 8.—Vesical stricture of the prostatic bed. G. L., aged 55. Six months after a transurethral resection of a median bar and a slight lobar hypertrophy, there developed a filiform stricture of the vesical neck. The tubular dilated prostatic urethra distal to the stricture is due to overdilatation by the pressure of the opaque medium.

Fig. 9.—Fusiform stricture of the prostatic bed. A. B., aged 63. The patient had difficulty in urinating and voided in small amounts and dribbles. Persistent pyuria existed two and one-half years after a suprapubic prostatectomy. Note the fusiform appearance of the posterior urethra caused by fibrosis of the vesical neck and the stricture of the membranous urethra with a dilated prostatic cavity between.

sule of its circulation. In some instances, the walls of the prostatic cavity were drawn together by mattress sutures. Inside the vesical neck two hemostatic sutures were placed at 5 and 7 o'clock just prior to removing the V-shaped piece from the posterior lip. This also devitalized tissue at the vesical neck.

CONCLUSIONS

1. Urethrographic study is superior to instrumental examination in the demonstration of postoperative strictures.

2. Urethrographic procedures are valuable to record progress after urethral dilatation and to determine the need for further therapy.

3. The prevention of strictures after prostatic operations is possible through the application of rational surgical principles.

ZUSAMMENFASSUNG UND SCHLUSSFOLGERUNGEN

1. Zum Nachweis postoperativer Harnroehrenverengungen ist die roentgenologische Kontrastdarstellung der Harnroehre der instrumentellen Untersuchung ueberlegen.

2. Die Urethrographie ist wertvoll zum Nachweis der Resultate der Harnroehrendilatierung und zur Entscheidung, ob eine Fortsetzung der Behandlung noetig ist.

3. Dem Auftreten von Strikturen nach Prostataoperationen kann durch die Anwendung vernuenftiger chirurgischer Grundsaetze vorgebeugt werden.

Fig. 10.—Scarification of the prostatic bed. W. B., aged 68. Persistent pyuria and incontinence continued for two years after a suprapubic prostatectomy at another clinic. Note the filiform stricture of a major portion of the prostatic portion of the urethra. Infection and fibrosis were secondary to residual prostatic tissue.

RESUMEN Y CONCLUSIONES

1. La uretrografía es superior al examen instrumental en la demostración de estenosis postoperatorias.

2. La uretrografía es de valor para registrar progresos después de dilatación uretral y determina las necesidades terapéuticas consiguientes.

3. La prevenció de estenosis consecutivas a la cirugía prostática es posible mediante la aplicación de principios quirúrgicos racionales.

RIASSUNTO E CONCLUSIONI

1. Uretragrafia e' superiore al esame istrumentale nelle dimostrazioni di stenosi postoperatorio.

2. Uretragrafia e' di valore a registrare il progresso dopo dilatazione uretrale e decidere il bisogno di piu terapia.

3. L'impedimento di stenosi secondo chirurgia prostatica e' possibile traverso l'applicazione di principii chirurgiche ragionevole.

RÉSUMÉ ET CONCLUSIONS

1. L'uréthrographie est préférable à l'examen instrumental pour faire le diagnostic de rétrécissements post-opératoires.

2. L'uréthrographie a une valeur particulière pour enregistrer l'amélioration après une dilatation uréthrale et déterminer la nécessité de dilatations ultérieures.

3. On peut prévenir les rétrécissements post-opératoires à l'intervention sur la prostate en suivant rigoureusement les principes de la chirurgie opératoire.

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We wish to thank Miss Ericka Carlan, John Hopkins Medical School, for the drawings in Figure 6.

To Our Contributors Abroad

We regret to announce that under current publishing conditions it has become impossible for the *Journal* to arrange the translation into English of original articles submitted in other languages. With the single exception of articles written specifically for the *Seccion en Espanol*, which, of course, do not require translation, we must therefore request that all articles henceforward be submitted in the English language. Prompt publication can be greatly facilitated if all manuscripts are typed in double or triple space to allow room for editorial corrections. Your cooperation will be deeply appreciated.

The Problem of "Bleeding Nipple"

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THE purpose of this communication is to discuss the clinical and pathologic factors which govern the treatment of so-called bleeding nipple. The basis of my presentation is a personal series of 3,256 cases observed during the last twenty years.

Few clinical problems present such divergent opinions as the treatment of a breast exhibiting a sanguineous or serosanguineous discharge from the nipple. The indicated procedure is simple enough when a mass is palpable, but in 54 per cent of cases no mass can be felt, and it is this group that constitutes the present dilemma. If one is prepared to accept the view of those who advocate routine mastectomy for bleeding nipple, the problem, of course, disappears. But is one justified in removing the breast of a young woman for a lesion that is almost certainly benign? Actually, the main issue is this: *Under what circumstances is mastectomy advisable, and under what conditions is one justified in adopting more conservative measures?*

Having established that the bleeding is not from the surface of the nipple, one must exclude two conditions before assuming that the underlying cause is a neoplasm. These are vicarious menstruation and hypertension. Both are exceedingly rare and for this reason should be remembered in the differential diagnosis. Bleeding in the breast associated with hypertension has been described as "apoplexy of the breast." Transillumination is of distinct help in making the diagnosis. In cases of vicarious menstruation a careful history elicits the fact that bleeding is usually bilateral and is associated with the menstrual cycle.

With the aforementioned rare exceptions, the lesion underlying the syndrome of "bleeding nipple" is either a duct papilloma or a duct carcinoma. When a tumor is palpable and the clinical signs indicate it to be related to the bleeding, the procedure is clear. The tumor must be excised and examined microscopically, and if carcinoma is present, the radical operation is indicated.

When a tumor cannot be palpated, transillumination often discloses an area of opacity, and pressure over this site causes the escape of blood from the nipple. In these cases the site of the opacity is marked on the skin with the patient lying down, and the area is excised. Microscopic study of the specimen again determines any further procedure.

The difficult problem arises in those cases of bleeding nipple in which no tumor is palpable. The clinical question is, of course, how often does cancer occur in this group? In my experience, this is a rare event. I have seen only 2 examples in 30 cases. In 1 case a carcinoma developed at a considerable distance from the initial lesion, thirteen years after interstitial irradiation. In a second case excision of multiple papillomas around the nipple was followed one year later by carcinoma in another portion of the same breast.

A marked difference of opinion exists upon this question. Those who look upon a duct papilloma as an innocent lesion base their position upon the fact that in certain patients harboring this lesion carcinoma fails to develop after a lapse of some years, even though the lesion is not treated. On the other hand, those who look upon this lesion as a grave menace point to the following evidence:

1. A certain proportion of breasts exhibiting a bloody discharge from the nipple ultimately become affected by carcinoma.

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2. The supervention of carcinoma upon the benign process may require thirty or forty years or even longer, so that breasts which have escaped this complication for a relatively few years are by no means immune.

3. In the benign papillomatous state in other organs, notably the bladder and the colon, the eventual supervention of vesical carcinoma is frequent and that of carcinoma of the colon almost a certainty.

4. Experimental evidence, particularly from experiments with tar, proves the benign papillomatous stage to be one step in the cancer process.

Localization.—When a tumor is palpable, transillumination helps to localize the lesion and pressure over the mass generally causes the escape of blood from the nipple. When a tumor cannot be felt, transillumination usually discloses opacity, and pressure over this site causes the escape of blood. Examples in which careful study by transillumination fails to disclose opacity are rare. This occurred in only 5 cases among the 30 in which no tumor could be palpated.

Treatment.—Local excision for duct papilloma is applicable to those lesions situated in the region of the nipple or areola which can be localized by transillumination. This conservative procedure is especially indicated when the patient is young, when the chances of carcinoma are at a minimum, and because the patient prefers to avoid or actually refuses removal of the whole breast.

The disadvantages of local excision for this lesion are numerous:

1. If carcinoma exists, the excision is inadequate. This objection is overcome by preparing a frozen section of the removed specimen and carrying out further treatment if carcinoma is present.

2. Although transillumination fails to disclose but one lesion, other microscopic lesions may be present and remain outside the field of operation.

3. The papillomatous process is sometimes so widespread as to involve the entire duct system of the breast.

4. There are considerable technical difficulties in attempting to execute a local excision for duct papilloma, which may prove unsuccessful.

Thus local excision is impossible in the group of cases in which the lesion cannot be localized by palpation or transillumination, inadequate in cases of diffuse papillomatosis, and uncertain of removing the entire lesion in cases of apparently localized papillomas. Furthermore, it must be promptly followed by more extensive surgical measures if carcinoma is discovered in the excised specimen.

Surgeons, therefore, find themselves in a rather unsatisfactory position as regards the surgical treatment of this group of patients. The wisdom of performing complete local mastectomy in older women is undisputed. But with younger women the question arises, are we justified in recommending the removal of the entire breast in the presence of a serous or serohemorrhagic discharge from the nipple for a lesion which is probably not cancer and which, although potentially cancerous, is not certain to become malignant?

Efforts to treat "bleeding nipple" by external irradiation have not been successful.

From every point of view, interstitial irradiation is superior to external irradiation if this form of therapy is to be used at all. Theoretical considerations are supported by clinical and pathologic proof that an adequate dose of irradiation administered to papilloma by the interstitial method results in destruction of the lesion and its replacement by fibrous connective tissue without radionecrosis. I first presented this idea and reported 2 cases in 1934. At that time I said:

"It seems logical to suggest the implantation of removable radium element needles for the treatment of selected patients suffering from a serous or serohemorrhagic discharge from the nipple. The method offers the advantage of avoiding the radical procedure of breast amputation for a lesion which may not be cancer and usually is not cancer when treatment is administered and which possibly may never become cancer. It is a

more complete procedure than local excision as it treats the entire duct system of the breast and at the same time avoids surgical interference. It should be adequate to destroy completely an early duct carcinoma and especially if it is so early as to fail to be accompanied by a palpable tumor.

"It appears to me to offer an intermediate method between two extremes: the one, over-conservatism, consisting of no treatment, which is dangerous, and the other, complete removal of the breast, which although safe, may be considered radical for small benign lesions."

I have used this method in a total of 20 cases. The discharge in most cases was hemorrhagic; in a few, nonhemorrhagic. In none was there a palpable mass. In all but 5 localization was accomplished by transillumination.

Results.—In 15 cases the discharge disappeared and did not recur. In 1 case, in which the patient was treated thirteen years ago, the discharge ceased completely after four years and has not recurred. In another patient, treated nine years ago, the discharge disappeared only after six years and has not recurred. In 2 cases the discharge continued for one year and local surgical excision of the treated area was performed.

Subsequent operation was performed in 5 of the 20 cases. In 1 case, followed for five years with no recurrence of the discharge, bilateral simple mastectomy was performed because of bilateral diffuse nodularity with special localization in the treated area. This radical procedure was adopted because of the presence of a strong family history of cancer of the breast. Microscopic study of the tissues from the treated breast showed marked fibrosis with small papillomas in areas distant from the irradiated area, and also cystic disease of the opposite breast.

In 1 case local excision of the treated area was performed by another surgeon one year after treatment. The discharge had not recurred. The microscopic diagnosis was fibrosis and fat necrosis.

In 1 case simple mastectomy was performed after one year because the discharge failed to stop. Microscopic examination disclosed fibrosis and papillomas.

Of 2 other cases, simple mastectomy was performed in 1 and local excision in the other (elsewhere). In both instances the microscopic diagnosis was fibrosis.

Of 15 cases in which interstitial irradiation was done but not followed by operation, cancer developed in 1 (6 per cent). It is interesting that this incidence of 6 per cent is the same as the incidence of cancer after local surgical excision (Geschickter) and compares favorably with the incidence of cancer in the opposite breast after radical mastectomy for cancer.

The case of the patient in whom cancer developed thirteen years after irradiation is here presented.

REPORT OF CASE

A white married woman aged 41 was first examined on Nov. 27, 1932. She complained of a spontaneous discharge from the left nipple of two months' duration. Her father, an aunt and a sister had died of cancer, but the sites of the cancers were not known. Examination failed to disclose any masses in the breasts. Transillumination demonstrated a faint opacity in the left areola at 9:30, and pressure on this area yielded a clear straw-colored fluid from the left nipple. Microscopic examination of the fluid showed a few red blood cells. A diagnosis of papilloma was made, and on November 29 eleven 2 mg. and five 1 mg. removable radium needles were inserted around the areola. The filtration was 1 mm. of platinum. The needles, totaling 27 mg., were left in place for seventy-two hours. The total dose was 1,944 milligram hours. On December 10 it was noted that the discharge, even on pressure, had subsided completely. It did not reappear. On April 6, 1933, a small, soft subcutaneous mass was first noted in the left axilla. On April 25 the mass had not changed. The patient was not seen again until January 1937, at which time there was no evidence of disease or discharge. The patient was given an appointment to return in six months but did not report. On May 2, 1945 (thirteen years after the irradiation) she reported to another surgeon, who found a mass in the *upper portion of the left breast.* A radical mastectomy was performed by him on

May 7, and carcinoma was found. The patient was living without disease two years later.

SUMMARY AND CONCLUSIONS

1. Among 3,256 consecutive cases of pathologic conditions of the breast, there were 211 (6.4 per cent) with a discharge from the nipple, of which 114 (3.5 per cent) showed a hemorrhagic discharge.

2. Twenty patients in whom there was no palpable tumor were treated by removable platinum radium needles. On 5 of these, subsequent operation was performed. Of the other 15, cancer developed in 1, thirteen years later. The patient was well two years after radical mastectomy (fifteen years after irradiation).

3. With the rarest exceptions, bleeding from the nipple is caused by papilloma (65 per cent) and by carcinoma (35 per cent).

4. In approximately one-half of the author's cases there was no palpable tumor. In this group, the incidence of cancer was 6 per cent.

5. Localization of the underlying lesion is possible in about 50 per cent of cases, by palpation; and in about 35 per cent of additional cases, by transillumination.

6. In approximately 15 per cent of cases localization is impossible by present methods.

7. In approximately 85 per cent of cases in which localization is possible, surgical excision is indicated. If carcinoma is present, radical mastectomy is performed; otherwise an effort is made to remove the underlying lesion with as little mutilation as possible.

8. When the lesion is diffuse and widespread, mastectomy may have to be performed.

9. Since the incidence of cancer is so low in the absence of a palpable tumor, an effort to save the breast should be made in the case of the younger woman, especially in the absence of a clear-cut family history of cancer of the breast.

10. In the small group (approximately 15 per cent) of breasts in which localization is not possible, occurring in young women with a normal family history, interstitial irradiation should be considered.

11. Under special conditions, a combination of surgical excision, to rule out carcinoma, followed by interstitial irradiation appears to be the only procedure which is reasonably safe and which, at the same time, avoids total mastectomy. The conditions referred to apply to very young women with a normal family history but with lesions too widespread for limited surgical removal, in whom total mastectomy might result in severe psychologic trauma.

12. Stimulated by increasing cancer education of the profession and laity, there is developing a dangerous tendency toward radical operation which, on careful reflection, does not appear to be warranted. The routine removal of the breast for "bleeding nipple" is an example of this trend. The easy theory that removal of all the breast tissues will forever relieve the patient of the danger of cancer of the breast and the surgeon of all responsibility is hardly consistent with sound medical practice. It must be assumed as basic that preservation of the breasts for functional, cosmetic and psychosexual reasons is desirable and commendable, provided it can be accomplished with reasonable safety.

RÉSUMÉ ET CONCLUSIONS

1. Parmi les 3,256 cas successifs de lésions pathologiques du sein, il y en a 211 (6.4%) qui présentaient un écoulement au mammelon; de ce même nombre, 114 (3.5%) présentaient un écoulement sanguinolent.

2. Les 20 patientes qui ne présentaient aucune masse palpable furent traitées par des aiguilles de radium. Cependant, cinq de cellesci durent plus tard subir une intervention chirurgicale. Des 15 autres, un cas eut une transformation néoplasique 15 ans après. Cette même patiente était très bien deux ans après l'ablation complète du sein. (15 ans après le traitement d'irradiation.)

3. A de très rares exceptions, l'hémorragie par le mammelon est conséctutive a

un papillome (65%) ouà un néoplasme (35%).

4. La moitié des cas présentés par l'auteur n'avaient aucune masse palpable; dans le groupe, le cancer était de 6% des cas.

5. Par la palpation, on peut localiser dans 50% des cas les lésions sous-jacentes; et dans 35% d'autres cas, par la transillumination.

6. Il est impossible par les procédés actuels de localiser la lésion dans une proportion de 15%.

7. Dans 85% des cas où il est possible de localiser les lésions, l'extirpation chirurgicale, une mastectomie radicale est faite; autrement, on doit s'efforcer d'enlever les lésions sous-jacentes avec le moins de mutilation possible.

8. Si les lésions sont diffuses et étendues, on sera peut-être obligé de pratiquer une mastectomie.

9. Puisque la présence de cancer est si rare quand il n'y a pas de masse palpable, on doit s'efforcer de conserver le sein, surtout s'il s'agit d'une jeune femme, et surtout avec aucun signe clinique défini de cancer.

10. Dans le petit nombre (15% environ) de seins où il est impossible de bien localiser la tumeur, chez des femmes jeunes et présentant un terrain familial normal, il faut songer à l'irradiation des cavités interstielles.

11. A certaines conditions, la combinaison d'extirpation chirurgicale de la masse cancéreuse et d'irradiation interstielle semble être le procédé le plus certain pour éviter la mastectomie totale. Ces conditions s'appliquent aux très jeunes femmes avec une histoire familiale normale, dont la lésion est trop étendue pour permettre une ablation chirurgicale trop restreinte et chez qui la mastectomie totale déclancherait un traumatisme psychologique sérieux.

12. A cause d'une propagande intense, dans la profession médicale et dans le public, on pratique trop souvent une chirurgie mutilante qui ne s'impose pas. On enlève, de routine, tous les mammelons qui saignent. Cette pratique facile d'enlever tous les tissus du sein n'enlève pas à la patiente le danger de cancer ni au chirurgien sa responsabilité professionnelle. On doit prendre pour acquis qu'il faut conserver le sein pour des raisons physiologiques, d'esthétique et psychosexuelles en autant que faire se peut, sans risquer la vie de la patiente.

ZUSAMMENFASSUNG UND SCHLUSSFOLGERUNGEN

1. In einer Reihe von 3256 aufeinanderfolgenden Faellen von Erkrankungen der Brustdruese befanden sich zweihundertelf (6.4%) mit Absonderungen von der Brustwarze. Hundertvierzehn (3.5%) zeigten blutige Sekretion.

2. Zwanzig Patienten, bei denen keine Geschwulst palpierbar war, wurden mit entfernbaren Platinradiumnadeln behandelt. Fuenf davon wurden anschliessend operiert. Von den uebrigen fuenfzehn Kranken entwickelte eine einen Krebs nach dreizehn Jahren. Diese Kranke zeigte zwei Jahre nach radikaler Brustdruesenresektion (d.h. fuenfzahn Jahre nach der Bestrahlung) keine Krankheitserscheinungen.

3. Blutungen von der Brustwarze werden mit ganz geringen Ausnahmen durch Papillome (65%) und durch Karzinome (35%) hervorgerufen.

4. In etwa 50% der Faelle des Verfassers bestand keine tastbare Geschwulst. In der vorliegenden Serie betrug das Vorkommen von Krebs 6%.

5. Die zugrundeliegende Erkrankung kann in etwa 50% der Faelle durch Palpation und in zusaetzlichen etwa 35% durch Transillumination lokalisiert werden.

6. In etwa 15% der Faelle ist eine Lokalisation mit Hilfe der zur Zeit verfuegbaren Methoden unmoeglich.

7. In etwa 85% der lokalisierbaren Faelle ist die operative Entfernung der Geschwulst angezeigt. Wenn ein Krebs vorliegt, wird eine radikale Amputation der Brustdruese ausgefuehrt; andernfalls wird versucht, die zugrundeliegende Erkrankung unter moeglichst geringer Verstuemmelung zu entfernen.

8. Ist die Erkrankung zerstreut und

weit verbreitet, mag eine Entferung der Brustdruese noetig sein.

9. Da beim Fehlen einer tastbaren Geschwulst das Vorkommen von Krebs so sehr selten ist, sollte bei juengeren Frauen, besonders wenn die Familienanamnese nicht ganz deutliche Hinweise auf Brustkrebs ergibt, ein Versuch, die Brust zu erhalten, gemacht werden.

10. In der kleinen Gruppe von Faellen (etwa 15%) wo bei jungen Frauen mit normaler Familiengeschichte eine Lokalisation der Erkrankung unmoeglich ist, sollte die interstitielle Strahlenbehandlung in Betracht gezogen werden.

11. Unter besonderen Bedingungen erscheint eine Kombination der operativen Entfernung des Tumors (um einen Krebs auszuschliessen) mit anschliessender interstitieller Bestrahlng das einzige Verfahren zu sein, das einigermassen sicher ist und gleichzeitig eine totale Entfernung der Brustdruese vermeidet. Das bezieht sich auf ganz junge Frauen mit normaler Familienanamnese, bei denen die Erkrankung fuer eine umschriebene Exzision zu ausgedehnt ist, und bei denen andererseits in totale Entferung der Brustdruese ein schweres seelisches Trauma hervorrufen koennte.

12. Die wachsende Aufklaerung der Aertzteschaft und des Publikums auf dem Gebiete der Krebskrankheiten beguenstigt eine gefaehrliche in der Entwinklung begriffene Neigung zu Radikaloperationen, die bei sorgfaeltiger Ueberlegung nicht gerechtfertigt zu sein scheinen. Ein Beispiel dieser Tendenz bildet die routinemaessige Entfernung der Brustdruese wegen "blutender Warze". Die leichtfertige Theorie, dass die Entfernung der gesamten Brustdruese die Patientin fuer immer der Gefahr des Brustkrebses und den Chirurgen jeder weiteren Verantwortung enthebt, laesst sich mit einer vernuenftigen aertztlichen Haltung kaum vereinbaren. Die grundlegende Tatsache, dass die Erhaltung der Brueste aus funktionellen, kosmetischen und psychosexuellen Gruenden wuenschenswert und empfehlenswert ist, darf, wenn dieses Ziel mit einen annehmbaren Grade von Sicherheit erreicht werden kann, nicht ausser Acht gelassen werden.

RIASSUNTO

1. Apresso 3,256 casi consecutivi di condizioni patologici della mammella vi erano 211 (6.4%) con secrezione dal capezzola, di quali 114 (3.5%) dimostravano secrezione emorragica.

2. Venti paziente nelle quale non esisteve tumore palpabile furono trattati per aghi ritirabile radio-platino. Su 5 di queste, operazione susseguente eseguiva. Degl'altri 15 casi, cancro sviluppo' in 1 tredici anni dopo. La paziente era bene due anni secondo mammectomia radicale (15 anni dopo irradiazione).

3. Colle piu rare eccezioni, secrezione sierosoematica dal capezzolo e' causa di papilloma (65%), e di carcinoma (35%).

4. Non esistiva tumore palpabile prossimo meta' dei casi dall'A. in questa gruppo, l'incidenza di cancro era 6%.

5. Localizzazione della lesione e' possibile in circa 50% dei casi per palpazione; ed in circa 35% in oltri casi per transilluminazione.

6. Per approssimazione 15% dei casi, localizzazione e' impossibile presso di metodi presenti.

7. L'estirpazione chirurgica e' indicata in 85% dei casi nelle quale localizzazione e' possibile. In caso di carcinoma mammectomia radicale e' ormai fissata; altrimenti unosforza e' fatto a rimuovere la lesione con minima mutilazione.

8. Quando la lesione e' diffusa e larga, mammectomia puo essere eseguita.

9. Poiche' l'incidenza del cancro sia cosi bassa nell'assenza di tumore palpabile, uno sforzo a salvare il seno dovrebbe essere considerato in caso d'una donna piu giovane, specialmente nell assenza d'un anamnesi chiaro di famiglia di cancro della mammella.

10. Per un gruppo piccolo circa 15% delle mammelle quale localizzazione non sia possibile, in donne giovane con anamnesi normale, irradiazione dovrebbe essere considerata.

11. Sotto condizioni straordinari, l'associazione d'estirpazine chirurgica, a negare carcinoma, seguita ad irradiazione sembra ad essere l'unico procedimento che

e ragionevolmente salvo e che, al medesimo tempo evita mammectomia totale. Le condizioni riferiti applicano a donne veri giovani coll anamnesi normale ma colle lesioni troppe estese per estirpazione limitata, nelle quale mammectomia totale risulterebbe in trauma psicologico severo.

12. Stimulata d'un aumento di educazione sul cancro nella professione ed i laici, vi e' sviluppando una tendenza pericolosa verso operazione radicale che, con biasmo vigilante, non sembra giustificabile. La pratica di rimuovimento del seno per "capezzolo sanguinolento" e un esempio di questo corso. La teoria dolce che rimuovimento di tutti tessuti mammaria sollevera' per sempre il paziente del pericolo di cancro ed il chirurgo di ogni risponsabilita' non conforme alla pratica solida. Bisogna pretendere fondamentalmente che conservazione delle mammelle per ragioni funzionali, cosmetici e psicosessuali sia desirabile e commedabile, purche' si puo effettuare con ragionevole sicurta'.

RESUMEN Y CONCLUSIONES

1. En 3,256 casos consecutivos de estados patológicos mamarios hubieron 211 (6.4%) con salida de líquido del pezón, siendo hemorrágico en 114 (3.5%).

2. Se trataron con rodiumagujas de platino amovibles 20 pacientes sin tumor palpable, habiéndose operado 5 posteriormente. De los 15 restantes, en 1 se desarrolló cáncer 13 años más tarde. El paciente estuvo bien 2 años después de la mastectomía radical, 15 años después de la irradiación.

3. Con muy raras excepciones, lo hemorragia del pezón se debe a papiloma (65%) y a caricoma (35%).

4. En la mitad aproximadamente de los casos del autor no hubo tumor palpable, habiendo sido la incidencia de cáncer en este grupo de 6%.

5. Es posible localizar por palpación la lesión subyacente en el 50% approximadamente de los casos, y por transiluminación el 35% aproximadamente de casos adicionales.

6. Es imposible la localización con los métodos actuales en el 15% aproximadamente de los casos.

7. La extirpación quirúrgica está indicada en el 85% aproximadamente de casos en los que es posible la localización. Mastectomía radical en tratándose de carcinoma. En caso contrario esforzarse por extirpar la lesión subyacente con la mutilación mínima posible.

8. Puede efectuarse mastectomía cuando la lesión es difusa y extensa.

9. Dado que la incidencia de cáncer es tan baja en ausencia de tumor palpable, esforzarse por salvar la mama en caso de mujer muy joven, especialmente en ausencia de antecedentes familiares de cáncer mamario.

10. Deberá considerarse la irradiación intersticial en el pequeño grupo (15% aproximadamente) de mamas en que no es posible la localización, ocurriendo en mujeres jóvenes con antecedentes familiares normales.

11. Bajo condiciones especiales, una combinación de extirpación quirúrgica, para excluir carcinoma, seguida de irradiación intersticial parece ser el único procedimiento razonablemente segura y que, al propio tiempo, evita la mastectomía total. Estas condiciones son para aplicarse en mujeres muy jóvenes, con antecedentes familiares normales pero con lesiones demasiado extensas para extirpación quirúrgica limitada, en quienes la mastectomía total puede resultar un grave trauma psicológico.

12. Estimulada por la creciente educación profesional y pública sobre el cáncer, se está desarrollando una peligrosa tendencia a laoperación radical que, reflexionando cuidadosamente, no parece estar garantizada. La fácil teoría de que la extirpación de todos los tejidos mamarios aliviarán definitivamente al paciente del peligro de cáncer, y al cirujano de toda responsabilidad, es apenas consistente para la práctica médica correcta. Debe afirmarse básicamente que la preservación de las mamas por razones funcionales, cosméticas y psicosexuales es de desearse y recomendarse, con tal de que pueda efectuarse con seguridad.

Ureterovaginal Fistula

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POSTOPERATIVE leakage of urine through the vagina is distressing to the patient and to the surgeon who performed the operation. Fortunately it rarely occurs, but when it does occur it is usually because of complications that develop during and after operations on the pelvic organs or after difficult labor. Each patient presenting this symptom must be carefully examined before the necessary corrective operative procedure can be outlined. In the majority of cases the injury that results in lack of control involves the bladder, but sometimes the fistula is due to ureteral injury, either alone or in combination with vesical injury. Previous articles have described the management of patients suffering with vesicovaginal fistula.[1] In order to clarify the subject further we have studied the case records of 35 patients for whom a diagnosis of ureterovaginal fistula was made at the Mayo Clinic from Jan. 1, 1930, through Dec. 31, 1949. Data concerning the etiologic factors, diagnosis and treatment will be reviewed.

Etiologic Data.—In the majority of our patients ureterovaginal fistula had developed during convalescence from a gynecologic operation. At first thought one might falsely conclude that this is a complication only of operations performed by inexperienced surgeons. That such is not the case is attested by a review of the discussion which has ensued after presentation of this subject at meetings during the past few decades. Admitted leaders in the field have thus informally reported cases. Fortunately, however, it is a rare complication, occurring, according to several authors, in approximately 0.4 per cent of hysterectomies. This figure, cited by Sampson[2] and by Newell,[3] seems high.

In 3 of the 35 cases observed by ourselves we have seen incontinence that developed after a difficult forceps delivery of an abnormally large infant. The patients in these cases all suffered from both vesicovaginal and ureterovaginal fistula. In each instance, in addition to the vesical injury, the left ureter was injured. In 3 other cases a combination of vesicovaginal and ureterovaginal fistula was present when the patient was first examined at the clinic. In 30 cases hysterectomy was the surgical procedure which led to the development of the ureterovaginal fistula. Twenty-three of these were abdominal hysterectomies; in 7 instances a vaginal type of removal was done. In 1 case posterior colpotomy had been performed in order to drain a pelvic abscess, and there is some reason to think that the ureterovaginal fistula formed as a result of erosion of the ureter rather than of surgical trauma. In 1 case the operation said to have been performed was abdominal suspension of the uterus and tubal ligation. In 6 of the 30 cases in which hysterectomy was performed the uterus was removed because of malignant disease. In 2 of these a Wertheim type of operation was performed. In such a procedure the risk of ureteral injury is no doubt greater than it is in the ordinary type of hysterectomy. However, in this operation the surgeon is usually very careful to isolate the ureters and thereby avoid clamping, ligating, cutting or otherwise injuring them.

According to the history given by the patient and by the surgeon who referred her to the clinic, the injury in practically every case was not recognized until several days to several weeks had elapsed after the operation. In some cases many months passed before the diagnosis of ureteral injury was established; mean-

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while the vaginal leakage was blamed on a weak bladder or urethral sphincter.

Every surgeon is justly conscious of the possibility of injury to the ureters; nevertheless, if the injury occurs it is nearly always at some stage of the operation when it is least expected. It is mandatory to avoid the ureters carefully at all times, especially when performing an unusually difficult operation, such as removal of large fibroids extending into the broad ligaments or of inflammatory adnexae, endometrial cysts or pseudomucinous cysts which are stuck tightly in the pelvis. The use of ureteral catheters as a guide, placed preoperatively, has been advocated, but most gynecologic surgeons believe this precaution to be unnecessary and some say that it is not much help even if done. We believe that the preoperative placing of ureteral catheters in an extremely difficult procedure, such as a radical Wertheim operation, might be justified.

Moore's recent article[4] discusses methods of repair that have been employed when ureteral injury is recognized at the time of operation. The history given in our cases indicates that injury is seldom recognized until much later, during convalescence.

Perhaps one common cause of ureterovaginal fistula is lack of proper care during reperitonealization of the pelvis, when a stitch can be passed through the ureteral wall or around the ureter, resulting in pressure necrosis and sloughing later, secondary to edema and inflammation. The ureter is not difficult to recognize when it lies in its normal course. Its contraction can be elicited as an aid in identification by gently pinching the ureter with a thumb forceps. However, in some instances the ureter is pushed from its normal course by large cystic or solid growths and is greatly lengthened and thinned, in which case it may easily be overlooked during the hurry of operation and thus unwittingly be clamped, severed and ligated. It has been stated that many ureters are thus injured and the damage not recognized because it is unilateral, the kidney on that side going on to atrophy without clinical recognition. We doubt that this is true, but our impression has not been verified by making routine postoperative excretory urograms in a large series of cases.

Diagnosis. — Suspicion of ureteral injury is usually entertained because of pain in the flank and sometimes high fever and elevation of the pulse rate soon after operation. When it is evident that urine is leaking through the vagina postoperatively, one thinks first of vesical injury, because it is more common than ureteral injury. One must, however, keep in mind that injury to the ureter may occur simultaneously. Several of the patients we examined presented such a combined lesion. Hence, it is very important to study each patient carefully before drawing definite conclusions and outlining therapy. If both ureters have been injured the fact is usually recognized soon after operation, because of failure of urinary excretion. In such cases there is no leakage from the vagina, and catheterization of the bladder will find it empty. However, in exceptional cases bilateral injury may occur, in which one ureter is completely occluded temporarily and the other only partially obstructed by a stitch through only a portion of it. In this case urine will be found in the bladder and, later, drainage into the vagina will occur first from one ureter and subsequently from the other. In such cases accurate diagnosis is usually somewhat delayed.

When leakage is due to injury of the bladder, total incontinence develops soon after operation and the patient is unable to void. However, it must be kept in mind that, as has been stated, total incontinence does not exclude the possibility of ureteral injury. Careful study, however, will establish the source of the urine in every case. Nevertheless it is sometimes difficult to prove the point, particularly if the vesicovaginal fistula is very small. If water colored with indigo carmine is placed in the bladder and it appears promptly in the vagina the diagnosis of vesicovaginal fistula is practically certain. The only

case in our series in which this was misleading was one in which the dye, by reflux up a dilated ureteral orifice, found its way into the vagina through a ureteral fistula. If indigo fails to appear in the vagina but a vaginal pack becomes soaked with urine it is certain that one is dealing with ureterovaginal fistula. Further proof of its existence can be obtained by studying the puckered area which is found usually high in the vaginal vault, to one side of the midline. Spurts of urine will sometimes be observed, especially if the ureter is still relatively normal in caliber and has good tone. If the ureter is dilated (as determined by an excretory urogram) urine will exude slowly. Sometimes a ureteral catheter can be passed into the sinus, and rarely it will go as far as the renal pelvis. In 2 of our cases, instead of going up to the kidney the catheter passed back down the lower segment of the ureter and entered the bladder through the ureteral orifice. In 1 case the ureter apparently was caught in the line of sutures over the stump of the cervix, because the urine drained into the vagina through the cervix.

Distortion and edema sometimes make cystoscopic study within the first two or three weeks after pelvic operations unsatisfactory, especially after vaginal hysterectomy. Identification of the ureteral orifices may be difficult. It is important to observe the orifices to note whether urine is spurting from them. The intravenous injection of indigo carmine is a great aid, because the normal ureter will spurt forcefully, whereas as a rule there will be no spurt of urine from the meatus of the ureter which is draining into the vagina. However, if only a small opening exists in a segment of the ureter, dribbling spurts of indigo-stained urine may come from the meatus.

Obstruction to the passage of a ureteral catheter will be observed in the majority of cases in the ureter involved in the fistula, but not always. We have noted several cases in which the catheter could be easily passed to the renal pelvis. Apparently, in such cases, the stitch that caused the fistula included only a small portion of the ureteral wall and the subsequent sloughing of this portion established the fistula.

Fig. 1.—Pyeloureterectasis on the left side. After the fistula had formed, an attempt had been made elsewhere to ligate the injured ureter through a vaginal incision.

The excretory urogram is a great aid in diagnosis. In most instances dilatation of the ureter and the renal pelvis and calyces will develop above the point of the fistula. If only one ureter is involved this dilatation will be in great contrast to the normal ureter and kidney on the other side (Fig. 1). But dilatation does not always occur, and in some cases in which practically complete obstruction exists there will be no visualization of the kidney whatever. In our series of cases preoperative excretory urograms were made in 34 cases. In 8 of them there was no pyeloureterectasis apparent, which is contrary to the general belief that a ureterovaginal fistula always results in ob-

struction and therefore dilatation of the ureter and the renal pelvis. In 1 case the fistula had existed for five years, and yet the urogram revealed the contour of the kidney and ureter to be entirely normal. However, in 21 cases varying degrees of pyeloureterectasis were noted in the urogram, and in 5 cases the kidney was nonfunctioning as far as the excretory urogram indicated. Nevertheless, in these cases sufficient urine was draining from the vagina to require the patient to wear a pad constantly.

It was possible to make retrograde pyelograms preoperatively on the involved side by passing a ureteral catheter through the vaginal sinus (Fig. 2) in only 5 cases. This indicates how helpful the excretory urogram has proved to be in the diagnosis of ureterovaginal fistula.

Treatment.—Hinman[5] has stated that in 50 per cent of cases ureterovaginal fistula will heal without surgical intervention. This opinion does not coincide with our own experience. The use of inlying ureteral catheters, if it is possible to pass them easily, thus indicating the presence of continuity of most of the ureteral wall at the point of injury, seems justified, particularly since in recent years the newer antibiotics are so useful in reducing the chance of renal infection to a minimum. In 1 of our cases, in which the patient was a physician's wife, repeated cystoscopic procedures over a period of two and a half years failed to close a fistula which was interpreted to be due to a slight nick in the ureteral wall very close to the intramural portion. Thirty-three cystoscopic procedures were done, including dilatation, fulguration, applications of solutions of silver nitrate, etc., without permanent benefit. Finally reimplantation of the ureter into the bladder was done, but three months later an excretory urogram revealed nonfunction of the kidney. Therefore, it would seem that unless conservative measures succeed early in the course of treatment one should resort to operation without undue delay.

Fig. 2.—Retrograde urogram made by injecting catheter passed into the vaginal sinus. Note medium which has collected in vagina.

Several things must be considered before deciding on the surgical procedure to be employed for the correction of ureterovaginal fistula. If the patient has suffered from repeated attacks of fever and chills and the excretory urogram reveals a nonfunctioning kidney or advanced pyeloureterectasis it is probably best to perform nephrectomy, but of course this operation can be done only if the opposite kidney is normal. It is certain that nephrectomy is the simplest operation, and often these patients are worn out and badly discouraged by previous attempts to correct the leakage. Nephrectomy, therefore, was employed in 20 of our cases. Examination of the removed kidney showed multiple cortical abscesses in most instances. In only 2 cases was the kidney somewhat atrophic; in all others it was larger than normal, in some instances four or five times the normal size. No attempt was made to re-

move all of the ureter, even though it was dilated; however, as much as could be conveniently removed through the usual lumbar incision was extirpated along with the kidney.

Reimplantation of the ureter into the bladder is theoretically the ideal operation, especially if fever and chills due to renal infection have not complicated the course and if the excretory urogram shows good function and little or no pyeloureterectasis. The point of injury to the ureter also helps one decide on the procedure. If it is only a few centimeters above the ureteral meatus or juncture with the bladder reimplantation can be easily done (Figs. 3 and 4); but if the injury is 8 to 10 cm. above the vesical wall it is unlikely that the ureter can be mobilized sufficiently well to permit reimplantation without tension. If an operation is done with the anastomosis under tension it will usually fail, resulting in renal atrophy. Operations have been described involving the use of a sleeve of vesical wall which is brought up to meet the shortened ureter. We have not used this procedure. In our cases the ureter was reimplanted into the bladder a few centimeters above the normal site, the ureter being brought through diagonally and the vesical wall being stitched over a small portion of the termination. Flaps of split ureter were not sewed within the vesical wall; rather, the end of the ureter was allowed to protrude 1 or 2 cm. into the vesical cavity as is done in ureterointestinal anastomosis. In 4 cases a splinting catheter was employed. In a total of 11 cases in this series reimplantation of the ureter into the bladder was performed.

In 2 of our cases, because of extensive destruction of the bladder by operations done prior to the patient's coming to the clinic, it was found necessary to utilize ureterointestinal anastomosis. In 1 of these cases bilateral transplantation was done and in the other case unilateral transplantation, the opposite kidney having long since stopped functioning because of ureteral occlusion.

Fig. 3.—Preoperative excretory urogram showing ureterectasis and fistula draining into the vagina.

In 1 of our patients with bilateral ureteral injury a combination of nephrectomy (for a badly infected kidney) and cutaneous ureterostomy was employed. For this patient cutaneous ureterostomy was chosen because she was severely ill and a large segment of ureter had sloughed away after a Wertheim hysterectomy for carcinoma of the uterus.

The success of reimplantation into the bladder should be greatly enhanced by the new antibiotics. Not only should these patients be seen when the kidney and ureter are in better condition because of avoidance of prolonged infection, but the use of such drugs during postoperative convalescence will improve the healing processes.

Results of Treatment.—There were no deaths from treatment. Those patients who underwent nephrectomy recovered without incident, and their fistulas of

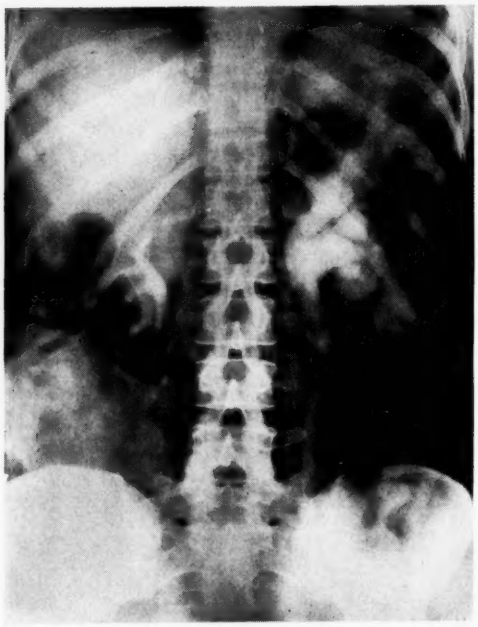

Fig. 4.—Urogram made six months after reimplantation of the ureter into the bladder, showing normal calyces and pelvis and absence of ureteral dilatation.

course promptly stopped draining immediately after operation.

Of principal interest is the result of reimplantation of the ureter into the bladder. In only 2 of the 11 cases in our series in which this procedure was employed has trouble with the kidney developed subsequently. In both instances renal atrophy occurred, and in 1 of these hypertension developed, whereas in the other the patient continued to have a normal blood pressure. In the other 9 cases the result of reimplantation was apparently excellent, for there were no symptoms and in 6 of them urograms made subsequently were interpreted as normal. Reimplantation into the bladder was done in 1 of our cases in spite of marked ureterectasis and apparently with an excellent result, for the leakage was corrected and the patient remained well until she was lost sight of more than a year after operation.

The patient who underwent cutaneous ureterostomy remained well for several years but finally had difficulty with the stoma, and her physician at home resorted to permanent nephrostomy, which continued to serve well for years.

The 2 patients for whom ureterointestinal anastomosis was done have both remained well from a clinical standpoint, but excretory urograms have disclosed moderate pyeloureterectasis. The Coffey-Mayo type of anastomosis was used in these cases. As has been stated, it was done only as a last resort because of extensive destruction of the bladder resulting from several operations performed earlier which had failed to correct leakage.

SUMMARY AND CONCLUSIONS

1. Thirty-five cases of ureterovaginal fistula were studied and significant data concerning them are presented. In 32 cases the history indicated that ureteral injury resulting in the formation of fistula had occurred during the course of operation on the pelvic organs. In 3 cases the injury resulted from forceps delivery of an abnormally large baby.

2. In addition to the ureteral injury, 6 of the 35 patients suffered from vesicovaginal fistula. In 2 cases both ureters were injured, and in 33 the injury was unilateral at the time of admission for treatment.

3. Cystoscopic examination and ureteral catheterization, excretory urographic study, vaginal examination with catheterization of the fistula if possible and sometimes retrograde urographic study are necessary to determine the point of injury and to establish the normality of the opposite kidney and ureter.

4. The operation most frequently employed to correct ureterovaginal fistula is nephrectomy (20 of our own cases). Reimplantation of the ureter into the bladder was employed in 11 cases and ureterointestinal anastomosis in 2 cases. In 1 case cutaneous ureterostomy was done after the opposite kidney had been removed (in a patient with bilateral fistu-

las). Two patients of the 35 refused operative treatment.

5. From a clinical standpoint the best results are obtained from nephrectomy; these patients get along very well if the remaining kidney is sound. Reimplantation of the ureter into the bladder should be done if the ureter is comparatively normal and there has not been a history of recurring fever and chills. Ureterointestinal anastomosis should be resorted to only when the bladder cannot be made useful.

6. In this series of 35 personally observed cases, in 33 of which surgical treatment was used, there were no deaths.

RÉSUMÉ AVEC CONCLUSIONS

1. Nous avons étudié 35 cas de fistule urétéro-vaginale avec leurs détails. 32 de ces cas devaient leur fistule urétérale à des manipulations chirurgicales d'origine pelvienne. 3 cas à la suite d'accouchements laborieux où l'on s'était servi de forceps.

2. En plus de leur fistule urétérale, 6 cas sur les 35 présentaient une fistule vésico-vaginale. Les 2 uretères étaient lésés dans les deux cas; les 33 autres, lors de leur admission, ne présentaient qu'une lésion unilatérale.

3. Pour déterminer le site de la lésion, et connaitre la valeur de l'uretère et du rein du côté opposé, il faut pratiquer une cystoscopie, un cathétérisme des uretères, une pyélographie endoveineuse, un examen du vagin avec exploration de la fistule; quelquefois même une pyélographie rétrograde.

4. Dans 20 de nos cas, la néphrectomie a dû être faite pour tarir la fistule. Onze autres cas ont eu la réimplantation vésicale de l'uretère, tandis que deux cas subirent l'urétéro-sigmoidostomie. Chez un patient présentant une fistule bilatérale, on a dû néphrectomiser un côté et pratiquer une urétérostomie cutanée de l'autre. Des 35 patients, deux seulement refusent l'intervention chirurgicale.

5. Au point de vue clinique, le meilleur résultat a été obtenu par la néphrectomie, à condition que l'autre rein soit suffisant. Pour pratiquer la réimplantation de l'uretère dans la vessie, il faut que l'uretère soit plutôt normal et qu'il n'y ait pas eu de frisson urinaire ou de fièvres urinaires. La réimplantation intestinale sera réservée aux seuls cas où la vessie ne peut plus servir.

6. Parmi cette série de 35 cas, il y eut 33 cas opérés sans mortalité aucune.

RESUMEN Y CONCLUSIONES

1. Se estudian 35 casos de fístula ureterovaginal y se presentan datos significativos referentes a los mismos. En 32 casos la historia reveló que la lesión ureteral, origen de la fístula, ocurrió durante la operación de órganos pélvicos. En 3 casos la lesión resultó de la aplicació de fórceps por parto con feto anormalmente grande.

2. Además de la lesión ureteral, 6 de las 35 pacientes sufrieron de fístula vésicovaginal. En 2 casos fueron lesionados ambos uréteres y en 33 la lesión era unilateral a su admisión para tratamiento.

3. Cistoscopia y cateterización uretral, urografía excretoria, examen vaginal con cateterización de la fístula si es posible y algunas veces urografía retrógada, son necesarios para determinar el sitio de la lesión y restablecer la normalidad del riñón y uréter contralaterales.

4. La nefrectomía es la operación más frecuentemente empleada en fístula ureterovaginal (20 casos del autor). En 11 casos se hizo la reimplantación del uréter en la vejiga y en 2 casos anastomosis ureterointestinal. En 1 caso se efectuó ureterostomía cutánea después de extirpar el riñón contralateral, en un paciente con fístulas bilaterales. No aceptaron el tratamiento operatorio 2 de los 35 pacientes.

5. Desde un punto de vista clínico se obtuvieron los mejores resultados con la nefrectomía, continuando los pacientes muy bien de encontrarse sano el riñón remanente. La reimplantación del uréter en la vejigo debe hacerse si el uréter es comparativamente normal y no ha habido historia de fiebre y escalofríos recurrentes. Debe recurrirse a la anastomosis uretero-

intestinal solamente cuando la vejiga no puede utilizarse.

6. No hubo ninguna muerte en los 33 casos operados de esta serie personal de 35 casos.

ZUSAMMENFASSUNG UND SCHLUSSFOLGERUNGEN

1. Es wird eine Reihe von fuenfunddreissig Faellen von Harnleiterscheidenfisteln untersucht und ein Bericht ueber die wesentlichen Befunde vorgelegt. In zweiunddreissig Faellen ergab die Krankheitsgeschichte, dass die zur Fistelbildung fuehrende Verletzung waehrend eines chirurgischen Eingiffs an den Beckenorganen erfolgte. In drei Faellen war die Verletzung das Result at der Zangengeburt eines uebernormal grossen Kindes.

2. Sechs von den fuenfunddreissig Kranken trugen ausser der Harnleiterverletzung noch eine Blasenfistel davon. In zwei Faellen waren beide Harnleiter verletzt, und in dreiunddreissig handelte es sich zur Zeit der Aufnahme zur Behandlung um eine einseitige Verletzung.

3. Um den Sitz der Verletzung zu bestimmen und die Unversehrtheit der anderen Niere und des anderen Harnleiters zu sichern, sind Blasenspiegelungen, Harnleiterkatheterisierungen, intravenoese Roentgendarstellung der Harnorgane, wenn moeglich vaginale Untersuchung mit Katheterisierung der Fistel und manchmal retrograde Roentgenuntersuchung der Harnorgane notwendig.

4. Die zur Beseitigung einer Harnleiterscheidenfistel am haeufigsten angewandte Operation ist die Nierenresektion, die in zwanzig unserer eigenen Faelle ausgefuehrt wurde. Die Wiedereinpflanzung des Harnleiters in die Blase wurde in elf und eine Ana stomose zwischen Harnleiter und Darm in zwei Faellen vorgenommen. In einem Falle wurde eine Ureterostomie durch die Haut nach aussen vorgenommen, nachdem die andere Niere entfernt worden war (es handelte sich um einen Kranken mit doppelseitiger Fistel). Zwei von den fuenfunddreissig Kranken lehnten eine chirurgische Behandlung ab.

5. Vom klinischen Standpunkt aus ergibt die Nierenresektion die besten Resultate; diese Kranken nehmen einen guenstigen Verlauf, wenn die verbleibende Niere gesund ist. Die Wiedeeinpflanzung des Harnleiters in die Blase sollte ausgefuehrt werden, wenn der Harnleiter verhaeltnismaessig normal ist, und wenn die Krankheitsgeschichte nicht wiederholtes Fieber und Schuettelfroeste aufweist. Das Anlegen von Harnleiterdarmanastomosen sollte nur dann ausgefuehrt werden, wenn die Harnblase nicht nutzbar gemacht werden kann.

6. Todesfaelle sind in dieser Serie von fuenfunddreissig Eigenbeobachtungen, von denen dreiunddreissig chirurgisch behandelte Faelle waren, nicht vorgekommen.

RIASSUNTO E CONCLUSIONI

1. Trentacinque casi di fistole ureter-evaginali furono studiati e presentano tema significante sopra di questi. In 32 casi l'anamnesi indicava che il danno ureterale risultando nella formazione della fistola si presento' durante la condotta dell 'operazione sugl'organi pelvici. In 3 casi l'ingiuria risultava d'un parto a forcipe d'un bambino di grossezza anormale.

2. In aumento al danno ureterale, 6 dei 35 pazienti subirono fistola vescico-vaginale. In 2 casi ambedue ureteri furono ferite, ed in 33 il danno fu unilaterale all 'ora d'entrata per trattamento.

3. L'esame cistoscopico ed il cateterismo dell 'uretere, studio urografico escretorio, esame vaginale con caterterismo della fistola se possibile e qualche volte studio urografico retrogrado sono necessario a determinare la punta d'ingiuria e stabilire la normalita' del rene e dell' uretere dirimpetto.

4. L'operazione piu frequentemente impiegata a correggere fistola ureterovaginale e' nefrectomia (20 dei nostri casi). Ripiantare l'uretere nella vescica risultava in 11 casi e anastomosi ureterointestinale in 2 casi. In 1 caso ureterostomia cutaneo fu fatto dopoche' il

rene opposto era stato rimosso (nel paziente con fistole bilaterali). Due pazienti dei 35 rifiutarono trattamento operativo.

5. Dal punto di vista clinica i migliori risultati si ottengano da nefrectomia; questi pazienti vanno molto bene se il rene rimanente sia sano. Si dovrebbe ripiantare l'uretere nella vescica se l'uretere e' comparativamente normale e non vi e'stato anamnesi di febbre e brivido ricorrente. Anastomosi ureterointestinale sarebbe ricorso soltanto quando non si puo' servirsi della vescica.

6. In questa serie di 35 casi osservati personalmente, in 33 di quale trattamento chirurgico fu impiegato, non vi furono morti.

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The Relation of Cellular Oxidation to Cancer

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OXIDATIVE disturbances, mechanical, pathologic or physiologic, affecting localized cellular structures in epithelial tissues and organs have a tendency to encourage the reversion of individual cells to their fetal form and the development of malignant characteristics as the result of the action of some carcinogenic agent, either endogenous or exogenous.

This paper is the result of a gradually developing clinical impression. Reports of the most recent technical work have been investigated for confirmation or refutation of the concept. Nothing I have been able to find in this technical material or in authoritative texts has lessened my conviction that this principle is sound, and, though it may be entertained by many in an undeveloped form, I feel that, because of its implications and its practical application to the prevention of morbid processes and the treatment of nonmalignant processes, it will bear considered attention and elaboration. It stands to reason that technical research workers cannot be expected to recognize every facet of clinical application of their discoveries. Herewith is accumulated evidence pointing to the idea that some deviation from normal cellular physiologic structure must have occurred before carcinogenic factors can find any real hospitality in the body tissues.

Anderson has said "It is rare that cancer appears in normal tissue."[1]

The earliest cellular division in fetal growth occurs under conditions of uncertain oxygen supply, and even after the development of the placenta the oxygenated blood from the placenta is mixed with venous blood before being distributed to the fetal tissues. Then a smaller percentage of the oxygen is removed from the blood by the tissues than in postnatal life, and this situation exists when growth and differentiation are taking place at a tremendous rate.

In surveying the principles of cellular respiration as now understood, one finds that in unicellular organisms the acquisition of oxygen and the discharge of carbon dioxide are conceived to occur by simple to-and-fro diffusion through the membranes. As the complexity of animal bodies increases, more and more elaborate means for the support of the cellular respiration must be provided. These are known. In this study, however, I am concerned entirely with unit-cellular respiration in complex animal organisms and its relation to the development of cancer.

The nice relative balance between the red blood cell count and the (barometric oxygen tension pressure) as noted at various altitudes indicates that optimum oxygenation of the body tissues is necessary for the maintenance of organic health.

A low oxygen pressure in the arterial blood is characteristic of emphysema, congenital heart disease, Ayerza's disease, chronic carbon monoxide poisoning, chemical poisoning and repeated small hemorrhages.

The blood of the body holds approximately 1,200 cc. of oxygen, which is used by the tissues in approximately five minutes at rest and in a fraction of a minute at work.

Experiments cited by Best and Taylor[2] indicate a high degree of sensitivity on the part of the heart muscle to any reduction of available oxygen. Recognition of this principle is the basis of our present method of supplying adequate oxygen to patients with morbid cardiac-conditions. In work the demand of the heart muscle for approximately 40 cc. of oxygen per gram per hour and its refusal to produce without oxygen give some weight to the idea that there may be a relation to the very high degree of resistance of the heart

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muscle even to metastatic carcinoma. The heart soon refuses to function when lactic acid reaches a concentration of 0.07 per cent, whereas skeletal muscle will continue to contract in the presence of a lactic acid concentration of 0.2 per cent.

The concept of what is meant by cellular oxidation is clear enough as an abstract principle, but the exact mechanism in the body as compared with laboratory mechanisms, under conditions of work as compared with rest, and under conditions of unfavorable environment, such as a morbid body process, is variable and not completely understood. There is some difference of opinion as well as a great variation in different tissues and a considerable variation in similar tissues that have dissimilar functions. In connection with variable tissue metabolism, the illustration cited by Greenstein[3] in his chapter on the chemistry of tumors is interesting: "The metabolic pattern is as distinguishing a feature of each tissue as is the gross and microscopic morphology and constitutes a functional characteristic of the tissue. Each of the enzymes behaves qualitatively much the same way in all tissues. Quantitatively, however, the distribution of the enzymes varies in each of the tissues, and it is this quantitative distribution which constitutes the individual mosaic of each tissue."

High cystine disulfurase activity Plus high arginase activity Plus alkaline phosphatase activity	Pancreas	Liver Kidney
Bone	Very high activity of alkaline phosphatase	
Intestinal Mucosa	Neither much catalase nor much arginase Very high esterase as contrasted with bone.	

Thus macerated tissue may be identified in the test tube the same as inorganic chemicals.[3]

Greenstein has stated reasonably that it is useless to compare tumor tissue with the normal tissue from which it arises, but that it should be compared with the corresponding fetal tissue or regenerating tissue.

In the higher animals there are three well developed systems of oxidation. These are the aerobic system, in which molecular oxygen is supplied to the tissues, and two anaerobic systems, one of which (the more nearly normal) is motivated by enzymes, the other by the process of fermentation. All three forms of oxidation conform to the principle that the oxidation of a substance entails the loss of one or more of its electrons.[2b]

Greenstein stated that ". . . most of the tumors which have been studied appear to obtain a considerable part of their energy from fermentation processes."[3b]

Best and Taylor stated that ". . . skeletal muscle, embryonic tissues, malignant tumors, cartilage, intestinal mucosa, . . . the medulla of the kidney, depend in varying degree, in some cases predominantly, upon an anaerobic mechanism for energy liberation." They further stated that in muscles the anaerobic mechanism is an emergency process and that from nine to twelve times as much carbohydrate is required to produce a given amount of energy in an anaerobic as in an aerobic environment. "When the supply of oxygen is insufficient for cell respiration, the anaerobic mechanism comes into operation and large amounts of the products of fermentation are formed. In the presence of oxygen, the accumulation of anaerobic products is diminished in varying degree, depending on the supply of oxygen, the nature of the cells and other factors.[4]

"This suppression of fermentation by oxygen has become known as the 'Pasteur effect', since it was first observed by Pasteur in the case of yeast many years ago." "The 'Pasteur effect' is observed only in cells and tissues whose metabolic type is intermediate between these two extremes", that is, purely aerobic or exclusively anaerobic. Dixon, Burk, Stern and Lipman have written of the "Pasteur effect".

The mechanism by which oxidation of the metabolites of the tissue cells is motivated is under close study by a number of investigators and has been for the last

forty or fifty years (Best and Taylor) but there is still sufficient difference of opinion to indicate that much work remains to be done. The fact that cellular metabolites are stable in oxygen at the pH and temperature levels compatible with life indicates that the process is probably mediated by enzymes, as are most of the other economical body processes. These catalytic systems (as outlined by Best and Taylor) are divided into a number of different groups: (*1*) Dehydrogenases whose function is indicated by the name, (*2*) the oxygen activation group, and (*3*) vitamins and hormones.

As at present conceived, then, the processes of cellular oxidation are accomplished (*1*) by addition of oxygen, (*2*) by the removal of hydrogen and (*3*) by the withdrawal of one or more electrons.[4b] The third of these systems is the most complicated and is the conversion of ferrous to ferric chloride.

It remained for Keilin to coordinate and harmonize the apparently conflicting theories of Warburg and Weiland as to the control of cellular oxidation in 1929 and 1930. The iron-porphyrinprotein complex or cytochrome oxidase or respiratory enzyme (of Warburg) appears to be the mediator or link between the other factors of the system.[4c]

"At least three water-soluble vitamins are known to be very closely related to oxidative catalysts present in animal cells. Nicotinic acid in the form of its amide constitutes part of the pyridine nucleotides; riboflavin is a component of the flavoproteins; the active form of thiamin is thiamin pyrophosphate". Thiamin appears to assist in oxidative and other processes involving pyruvic acid.

"Each of the three vitamins, therefore, enters into the formation of an essential oxidation catalyst, in animal cells, having the essential properties of a prosthetic group or of a coenzyme associated with a specific enzyme protein. In all three cases dietary deficiency of the vitamines has been shown to cause a corresponding diminution of the amount of the corresponding catalyst in certain tissues of the deficient animal."[2b]

The more recent work of Scent-Gyorgyi involves the catalytic role of C4-dicarboxilic acids; that of Krebs, a cyclic mechanism for the oxidation of pyruvic acid.[2c]

There is an expression which is so frequently heard that it has become accepted as the proper means of indicating an environmental situation existing in the presence of cancer or prior to its development; it is a reference to a known or unknown "irritant." The expression is used quite uncritically, because cancer is so often encountered in association with a process involving mechanical irritation or a low-grade chronic infectious irritant. There is no proof that even the so-called chemical carcinogenic agents are truly carcinogenic. They may be only predisposing factors setting up an abnormal physiologic condition, e.g., of oxidation, whereas the true carcinogen can induce morbid cell growth. As a means of further emphasizing this point, I shall cite a number of accepted cancerous and precancerous situations and assert that nearly all can be explained on the simple hypothesis that deficient oxidation of individual cell elements in a tissue can take the place of the present pantheon of so-called carcinogenic agents, but only as a predisposing factor, leaving the specific carcinogenic agent no less and no more of a mystery than it is at present.

"Cancer of the lip is an extreme rarity in women, but not infrequent in men."[5c] The pressure of the pipe stem, particularly the hot clay pipe stem, is cited as a typical carcinogenic "irritant." Could it not well be that the pipe stem merely sets up a chronic irritation with round cell infiltration and induration, which interferes with the oxidation of the adjacent cells, increasing their susceptibility to the action of some as yet unidentified specific etiologic factor, by disturbing their normal metabolic processes?

"Cancer of the skin of the ear occurs ten times as frequently in men as in women." Here again appears the factor of chronic irritation due to weathering

and mechanical irritation setting up a barrier to the normal oxidative processes of the local tissues.

In general it may be said that primary carcinoma of the liver is rare. However, among orientals it is fairly frequent.[5d] There will probably be no disagreement as to the reason, namely, infestation of the liver by tropical parasites.

The question is: Is the action that of an irritant on cells destined to become cancerous, or is the action merely the setting up of a barrier of induration and/or edema which chokes certain adjacent tissue cells into susceptibility to the specific carcinogenic agent, whatever it may be?

A few references to research observations on the relation tumor tissue and normal tissue in the matter of oxidation are desirable in order to show their characteristic environment and physiologic characteristics. Greenstein referred to the experimental work of several investigators who were able to determine that ". . . tumors as a class of tissues were distinguished by a high anaerobic glycolosis."[3s]

"High anaerobic glycolysis appeared to be a general property of growing or multiplying tissues, since it was found in embryo tissue and testis, but in these normal tissues glycolysis was largely abolished by the presence of oxygen. In most tumors, on the other hand, the high anaerobic glycolysis was relatively little reduced when oxygen was admitted to the system; the same, however, could be said of the placenta."[3r]

Greenstein called attention to his conclusion that, notwithstanding the fact that some normal tissues overlap tumor tissues in their metabolic characteristics, ". . . if there is no evidence at present of a specific tumor metabolism, there is evidence of a uniform tumor metabolism."[3s]

Warburg's early prophecy of a deficient respiratory mechanism in tumors has been sustained by the observation of very low amounts of the cytochrome system, of catalase, of the flavin enzymes and of coenzyme in these tissues."[3t]

Another basic conclusion reached by Greenstein is interesting and significant. "No matter how or from which tissues tumors arise, they more nearly resemble *each other* chemically than they do *normal tissues* or than *normal tissues* resemble *each other*."[3u] "The metabolic pattern of tumors, furthermore, is nearly similar in all species studied: (*1*) a high rate of glycolysis; (*2*) an increased water content and (*3*) a low activity of cytochrome, are among the characteristics of practically all tumors in all species studied. . . These are but a few features of what appears to be a remarkable chemical uniformity in tumors as a class of tissues, and suggests that mechanisms involved in malignant uncontrolled growth are common to all tumors regardless of etiology, histogenesis or species wherein found."[3t]

Furthermore, it is important to determine the type of cell that is most susceptible to malignant change. It is the more lowly type of cell which is supposed to adapt itself to varying changes in the body or tissue structures. It is the source of new cells in the event of injury, new cells which are amenable to certain physiologic stimuli calling for stepped-up division or differentiation. To quote again from Anderson,[5e] "Fully differentiated cells such as those of the premenstrual hyperplasia and those of lactation acini do not divide and in all probability do not give rise to cancer."

Typical regeneration of tissue after injury is represented[5g] by the fibrocytes of connective tissues, the osteoblasts of bone, the chondroblasts of cartilage, the regeneration of capillaries from endothelium and regeneration of muscle and connective tissue of the blood vessels from mesothelium. Epithelial regeneris typical of the skin, the gastrointestinal tract, the liver and the kidneys, then, as has been mentioned, the cyclic regeneration of the endometrium and of the gland structure of the mammary glands in lactation.

If the analogy between normal and malignant anaplastic cells is to be of value, some basic physiologic factors must

be recognized. One of the most important similarities is the enzyme content of the tumor as compared with that of the normal parent tissue, since cellular metabolism, normal or abnormal, is controlled by their contained enzymes. On this point I may cite Greenstein, who stated[3c] ". . . most tumors appear to have qualitatively the same kind of enzymes and other components as normal tissues" (of the same kind). He stressed the fact that it is careless analysis to try to compare or contrast, for purposes of argument, the characteristics of malignant cells with normal tissue cell of a different type or function. Thus, as he again emphasizes, the malignant growth must be compared with the normal tissue of origin if any worth-while conclusions are to be reached. On the other hand, he observed[3d] that future research may reveal some definite and characteristic variation between normal tissues and corresponding malignant tissues.

Conversely, the chemical pattern, including the enzyme components, is more nearly the same in tumors as unrelated as carcinoma and sarcoma than in unrelated normal tissues. The degree of variation is also much narrower than that of normal tissues.[3e]

The specific differences in the enzymes acting as oxidases have a direct bearing on the environment most characteristically favorable to the origin and development of malignant growths.

"Tumors do not stand outside the metabolic range of normal tissue."[3f] On the other hand: "Most striking of the systems which in tumors stand at the lowest range of the normal tissues are the exidases."[3f] Greenstein expressed the opinion that normal tissues possess an as yet unmeasured enzyme reserve in, possibly, an undeveloped form, whereas "apparently tumors possess little if any enzymatic reserve of certain systems."[3f]

In "Conclusions Relating to Special Systems" Greenstein said: "One of the most striking features of the metabolism of tumors is their relatively low content of aerobic catalytic systems, i.e., cytochrome succinic and diamino acid oxidases, cytochrome, catalayse and flavin. . . ."[3g]

It is interesting in the light of experimental work done thus far to note the definite reduction in the content of certain oxidizing enzymes not only in the tumor tissue but, in the case of catalase at least, a reduction in the uninvolved tissues of the animal. These changes appear decidedly more pronounced in the case of the enzymes connected with the utilization of molecular oxygen.[3h]

Greenstein, referring to the work of Braun, mentioned: " . . . very low liver catalase values in human beings who had died of various forms of cancer. Later work showed that of all the individual enzyme systems studied in the livers of mice and rats bearing a wide variety of tumors, the activity of the catalase was by far the most affected . . . the decrease in the liver catalase is progressive with the growth of the tumor. Moreover, the effect of the tumor upon the activity of this liver enzyme was found to be reversible, for the complete removal of the tumor . . . resulted in the restoration of the catalase activity of the liver to the normal level."[3j]

"Of the various chemical approaches to the study of malignancy in tissues the solution of the problems concerned with metabolism and respiration rank among the most important".[3k] Thus one comes more and more to the realization that there is a fundamental difference of the tumor cell which it is not unreasonable to assume may have been brought about by its reaction to an unnatural environment.

To reiterate, "High anaerobic glycolosis appeared to be a general property of growing or multiplying tissues since it was found in embryonyl tissue and testis but in these normal tissues glycolysis was largely abolished in the presence of oxygen."[3l] ". . . Tumors as a class of tissues were distinguished by a high anaerobic glycolysis" (note: which is maintained even in the presence of adequate molecular oxygen.)

"The solution of the problem of cancer cannot depend entirely upon the hope of the happy and fortuitous d i s c o v e r y. Rather, this solution is more likely to stem from the patient and systematic accumulation of knowledge of the chemical dynamics of the cancer cell. It is manifestly impossible to attempt measures of rational and intelligent control of something unknown. One of the most urgent tasks at the present moment is, therefore, a frank, blunt, and concerted attack upon the chemistry of the cancer cell by every available analytic resource. . . It may well be that, once revealed, the explanation that a neo-plastic transformation may be absurdly simple and measures of control will follow readily."[5h]

This paper up to this point has been exploring the recorded investigations and technical chemical and pathologic dicta touching the nature of the cancer cell. I think it can now be assumed that there is some deviation from the normal[1] *before* tissue cells become frankly malignant, since the outstanding chemical change so far discovered has been a radical change in the cancer cell's capacity for maintaining its oxidation.

What is the optimal relationship of the oxidation process to physiologically normal tissue and regenerating tissue as compared with neoplastic tissue? One of the oldest principles of tissue regeneration is illustrated by the shingling or pressure dressing applied over varicose ulcers. Another well recognized example is use of the pressure dressing in the treatment of burns. In both of these conditions healing is enhanced by depletion of blood in the tissues. True enough, engorged tissues do not have an excess of arterial blood; but under conditions of pressure the arterial blood as well as the venous blood is decreased. In both cases reduced oxygen supply encourages regeneration.

Perhaps one should particularize "oxygen supply" in this and other examples by adding the word "molecular."

Another example, cited by Dr. Longmire in a recent paper presented May 17, 1949, adds further weight to the argument that even an excess of arterial blood may hinder healing. His reference was to a long-standing ulcerative condition in a cavernous hemangioma, which was encouraged to rapid granulation and healing by almost complete ligation of its arterial blood supply.

One of the most striking examples of cancer developing in the presence of physiologic inactivity was presented in a discussion of breast cancer several years ago. A woman had nursed several children of her own and wet-nursed a number of children for other women, 12 in all, but all on one breast. The interesting point was not that cancer developed, but that it developed in the breast which had not been used. This is perhaps not a perfect example of physiologic inactivity, because the breast doubtless did lactate and, not being emptied, was to that extent traumatized. This point, however, does no violence to my original premise that the resulting congestion would have caused induration and a consequent lowering of cellular oxidation. The number of multiparous women who have carcinoma of the breast represents a rather high percentage, and to it must be added the percentage of parous women who have not nursed their babies.

A group of statistics published in the June 1949 issue of the *British Journal of Cancer* points out the relation of occupation to cancer in the Netherlands for the years 1931-1935. A total of 51,124 cases was analyzed.

In the case of cancer of the cervix, the factor of injury and induration evidently bulks larger than does the factor of physiologic inactivity, for its incidence stands at 5.92 per cent of all cancers in married women, whereas it is only 2.325 for unmarried women. That, however, seems a fairly heavy percentage. It is in the case of cancer of the breast and ovary that the incidence becomes greater in the unmarried. The incidence of cancer of the breast was 17.06 per cent in the married as against 21.87 per cent in the unmarried.

Cancer of the breast classified by occu-

pation was much more striking, as there was a more clear-cut determination of factors. The following totals were recorded for unmarried women:

	Teachers	Nurses	Nuns	Domestics	Needlewomen
Cancer of stomach	16	15	60	132	36
Cancer of intestine	12	3	19	34	15
Cancer of breast	34	13	44	95	34

It may be that the high figure for domestics can be accounted for by the probable high incidence of mammary trauma, as well as ignorance and generally poor physical hygiene.

D. Lippert, who was in charge of the supervisory care of the prostitutes of Hamburg, Germany, stated: "Cancer of the womb occurred but once in my experience of eleven years at the General Infirmary and cases of prolapsus uteri were nil." (From *History of Prostitution* by W. W. Sanger, M.D.)

"Ninety per cent or more" of carcinomas of the thyroid originate in previously benign adenomas. The very nature of the thyroadenoma is such that there is a paucity of oxygen supply to its contents.[5h] The infrequency with which carcinoma develops in the diffusely hyperplastic gland associated with exopthalmic goiter has been noted by a number of observers.[5h]

In the stomach, atrophic gastritis, pernicious anemia, and (by some) peptic ulcer are considered predisposing factors.[5i]

In cases of cirrhosis of the liver, 3 to 7 per cent of the patients eventually have cancer.[5j] (Here there is an excessive amount of fibrous tissue cutting off the normal blood supply of the secretary and endothelial cells. In cholangiomas the connective tissue is dense and contains few capillaries.[5j]

Carcinoma of the breast: "A history of few pregnancies with irregularity of lactation is commonly elicited."[5k]

Adenocarcinoma of the breast is characterized by "an extremely hard, fixed, infiltrating nodule" and having "a dense hyalinized stroma with narrow, elongated columns of epithelial cells."[5l] In carcinoma simplex, the groups of cells are described as surrounded by dense stroma.[5m] In the comedo type, "adjacent breast tissue is generally atrophic."[5m]

In Paget's disease there is a chronic eczematoid inflammation of the nipple. Microscopically there is marked hyperkeratosis with vacuolated, pale, degenerative cells. The cells beneath the nipple are indurated.[5m]

In mucoid carcinoma the epithelial cells "are generally poor in detail, apparently because of mechanical pressure. The paucity of cells in the large mucoid masses is an expression of restraint of growth."[5n]

"Nulliparous women have a higher incidence of breast cancer than multiparous women."[3o]

"In neoplasms of the respiratory tract, Anderson argues that there is no real proof of derivation from alveolar epithelium but rather from bronchiolar epithelium"[5p] (Note the area of relatively poor blood supply and physical inactivity with frequent induration due to infections and/or mechanical and chemical irritants with their accompanying induration.)

"Primary tumors of the spleen are rare." "The frequency with which the spleen is involved secondarily by tumor formation is slight when we consider its high degree of vascularity. The reason for this infrequent involvement is not understood... Whether tumor cells reaching the spleen are destroyed more readily than in other organs is a question that has never been settled."[5q] Note: one thing is certain, and that is that there is an abundant supply of molecular oxygen present.

Of rabbits, Greenstein stated: "It is quite striking that the papilloma agent, introduced humorally finds its way to the site of injured and benignly neoplastic tissue and there induces m a l i g n a n t growth."[3p]

Anderson[5r] referred to the well known irritants which have long been recognized as etiologic in malignant change, such as pipes (especially clay) in lip cancer, soot in scrotal cancer in chimney sweeps, tar, Cashmir charcoal heaters in malignant

disease of the abdominal wall, actinic rays and blond skin, old scars, osteomyelitis, and syphilitic leukoplakia. In this connection he mentioned "the unexplained cancerous irritant that is present in old scars as from burns or osteomyelitis, the 'vague irritant' of syphilitic leukoplakia and a variety of others." "However," he added, "in most instances of squamous cell carcinoma the source of irritation or stimulation is not apparent."

In those cases in which an irritant is apparent, even though their variety is almost uncountable, there is one factor which stands out: induration, with its concomitant and resultant decrease in normal blood supply after the initial congestive phase has subsided. This decrease in normal blood supply results in a decrease in molecular oxygen and also in the vitamin elements which are an important factor in the enzyme phase of normal oxidation.

Now let us turn to the basal cell group of cancers in which "the source of irritation or stimulation is not apparent." Those on the face are said to be bounded for the most part by "the hair line, ears and upper lip."[5s] It is admitted that this is the area most exposed to climatic elements and also that the process is more common in men than in women. There are other factors operating in this area, however, that may well be considered: (1) the greater activity of the sebaceous glands about the nose, (2) moisture about the eyes, (3) relatively poor circulation of the ears, and (4) the habit of men of neglecting effective cleansing of the face in washing because a washcloth irritates the beard; as a result the central part of the face is also neglected, the glands become clogged, irritation is set up and again one notes engorgement and poor oxidation as predisposing factors. Women, on the other hand, are more fastidious and also are not so much exposed to the elemental sources of irritation.

". . . About 50 per cent of carcinomas of the vulva are preceded by chronic atrophic vulvitis."[5t]

Dr. Ian MacDonald, assistant professor of surgery at the University of Southern California, expressed the opinion that cancer of the mouth and stomach is favored by a diet deficient in B complex. (This could be further explained as due to deficiency in the cellular oxidation, dependent on B complex elements or secondary to mucosal atrophy.)

If the foregoing arguments and data give reasonable credibility to the idea that cellular vulnerability is enhanced by conditions disturbing local circulation, not neglecting any possible inherited tendencies, then consideration should be given to the practical application of prophylaxis by the physician.

Heretofore, attention has been concentrated on processes which were in an active state of irritation, such as chronic cervicitis and active ulceration of the stomach. These processes are now even more to be questioned, but the quiescent, previously active, inflammatory or scarred areas—the so-called "healed processes"—should be watched and carefully explored if there is the slightest question. It would emphasize the importance of elimination of the thyroid adenoma and also the cervix uteri when hysterectomy is performed, even though it may "look" normal. As was recently pointed out, the mortality expectancy of routine total prophylactic hysterectomy would be less than the mortality from cancer at present (Meigs, Surg., Gynec. & Obst. 90:137). Another case in point is the large pendulous breasts in middle-aged women, which are apt to be subjected to excessive pressure and the heat of close confinement by brassieres, or, on the other hand, frequent trauma from physical activity (note the cancer expectancy in the case of domestics in the Belgian statistics previously cited). It would lend more weight to the belief that gallbladders containing calculi should be removed even though the condition is apparently quiescent. Leukoplakia should be looked upon with a more jaundiced eye than formerly. Sessile excrescences in the colon and rectum should be treated and watched with added intensity. Carcinoma in situ assumes added importance. So-

called benign cutaneous growths in later life also should be given more attention than heretofore by the average physician.

"Rarely, if ever, does cancer arise in previously normal tissue."

SUMMARY

In discussing the relation of cellular oxidation to carcinoma, the author points out the possibility that many supposedly carcinogenic factors merely predispose to carcinoma by setting up a suitable environment. The presentation emphasizes Anderson's pronouncement, "It is rare that cancer appears in previously normal tissue."

RÉSUMÉ

Dans une discussion des relations de l'oxydation cellulaire avec le cancer, l'auteur souligne cette possibilité que plusieurs supposés facteurs cancérigènes se font que prédisposer l'entourage au cancer. Cet article ne fait que rendre plus emphatique cette citation d'Anderson: "à savoir que le cancer se trouve rarement dans du tissu normal."

RESUMEN

Al discutir la relación de oxidación celular a carcinoma, el autor puntualiza la posibilidad de que muchos de los factores que se suponen carcinogénicos sólo predisponen al carcinoma por situación en medio adecuado. Se invoca la sentencia de Anderson —Es raro que el cáncer aparezca en tejido normal.—

RIASSUNTO

Nel discutere la relazione dell'ossidazione cellulare a carcinoma, l'A. propone la possibilita' che molti fattori supposti carcinogenici semplicemente a carcinoma presso di costruire, predispongono contorno convenevole. La presentazione da enfasi al pronunciamento di ANDERSON, "E raro che il cancro apparisce nel tessuto normale."

ZUSAMMENFASSUNG

Der Verfasser eroertert die Beziehung zwischen Zelloxydation und Krebs und hebt hervor, dass moeglicherweise viele sogenannte krebserregende Faktoren eigentlich nur die Disposition fuer die Entstehung eines Krebses schaffen, indem sie ein geeignetes Milieu hervorrufen. Die Arbeit legt Nachdruck auf Andersons Ausspruch: "Krebs entsteht nur selten in gesundem Gewebe."

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Announcement

International Board of Occupational Surgery

The Executive Council of the United States Chapter and the Board of Trustees of the International College of Surgeons have unanimously approved the formation of an International Board of Occupational Surgery, the aims of which are (*a*) elevation of standards for the practice of occupational surgery, (*b*) conservation of the health of the worker after occupational injury, (*c*) official recognition of this specialty, (*d*) stimulation of interest in this field by students and members of the profession, and (*e*) cooperation in the establishment of facilities for graduate education in occupational surgery by means of residencies in hospitals affiliated with medical schools, or their equivalents.

Frederick W. Slobe, M.D., F.A.C.S., F.I.C.S., Chairman

E. C. Holmblad, M.D., F.A.C.S., Secretary

For further details, address Dr. Arnold S. Jackson, Secretary, United States Chapter, International College of Surgeons, 1516 Lake Shore Drive, Chicago 10, Illinois.

A Metallic Femoral Head Prosthesis for the Hip Joint

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THE mechanics of the hip joint, involving the anatomic and physiologic characteristics of the acetabulum, head, neck and trochanter of the femur, create difficulties in surgical reconstruction that have stimulated continued efforts toward improvement.

A more satisfactory solution of the problem of surgical treatment is still sought for such conditions as (*1*) fractures of the femoral neck in the extremely aged; (*2*) aseptic necrosis of the femoral head and neck; (*3*) painful partial ankylosis of the hip; (*4*) disabling deformities of the femoral head and neck, and (*5*) tumors requiring excision of the femoral head and neck.

A practical substitute, an internal prosthesis not too difficult to introduce and dependable enough to permit unharmful weight bearing within two or three weeks, would be a logical solution in many instances when these clinical complications are involved.

Bohlman and Moore first applied a complete substitute vitallium prosthesis, consisting of a spherical head, a neck and a sleeve bracket to slip over the femur. It was fixed with screws. Hudack also has made some interesting observations on joint replacement. Judet has used an acrylic head mounted on a metal pin to be inserted into the distal portion of the femoral neck and the trochanter. Peterson has described the collision prosthesis, an assembled head and neck substitute proposed by Jaenichen, which is bolted through the distal portion of the femoral neck and the trochanter.

The Extremely Aged. — An internal prosthesis for immediate replacement of the fragments of the fractured neck of the femur should be a valuable asset for the extremely aged patient, who is subject to all the uncertain surgical consequences of healing, such as failure of union or aseptic necrosis. The long protective period of limited weight bearing is just as essential for the aged as for younger persons. Total incapacity may result from the physiologic interruption of normal systemic functions in the aged person, even though the early surgical treatment of the hip is considered successful. When union fails or aseptic necrosis occurs, the physiologic capacity of the aged person, which has already been overtaxed, is in poor condition to withstand further surgical reconstructive procedures, which again call for long-continued inactivity. A substitute prosthesis should permit weight bearing in two to three weeks.

Aseptic Necrosis.—In the presence of aseptic necrosis of fractures of the femoral neck, the choice of a substitute internal prosthesis would, in many cases, be preferable to any of the surgical reconstruction operations, which often, at best, result in a painful hip or in unsatisfactory locomotion. Furthermore, even after the most promising surgical reconstruction has been accomplished, physiologic repair is still a threat to satisfactory restoration of function.

Ankylosis.—The surgical treatment of ankylosis of the hip, for which arthoplasty is indicated, has passed through evolutionary stages in which various intervening substances have been used to prevent readherence of the excised tissues. Complete excision of the head of the femur and the substitution of a prosthesis with a spherical head has received but passive

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consideration until recently. If such a prosthesis can be satisfactorily joined to the femoral trochanter and shaft to permit dependable and permanent resistance to the effect of functional activity, the resulting motion and weight-bearing strength would far exceed that provided by the use of intervening substances.

Deformities.—A suitable substitute internal prosthesis would be ideal for the painful arthritic hip, or for such disabling deformities as the mushroom head. There is always stormy opposition to stiffening the hip. Fusion admittedly relieves the pain, but successful bony fusion is not readily obtained, and in many cases the long period of postoperative immobilization is of permanent detriment to function.

Tumors. — Tumors requiring extensive or complete excision of the femoral neck create a situation in which substitution of an internal prosthesis also is highly desirable.

Hip Prosthesis.—The following requirements should be met:

1. The technic of application should not require time-consuming details of measurement and mechanics.
2. Construction also must be practical and not too complicated mechanically.
3. Fixation to the femur must be permanently stable and dependable. Atrophic, friable bone should not be a restriction to application of the prosthesis.
4. Adequate motion should be permitted without pain or possibility of displacement or impingement.
5. The muscle-propelling forces must be maintained.
6. Shortening of the leg must be kept at a minimum.
7. Stability and weight-bearing support must be dependable for necessary practical functions of the hip.
8. The substances used for the prosthesis must be enduringly tolerable to the tissues.
9. A long period of immobilization by plaster, or by other means, should not be necessary, because of such factors as age, muscle atrophy and other results of disuse.

The Door-Knob Hip Prosthesis. — The author has devised a prosthesis which successfully meets the aforementioned requirements. It is nicknamed the "door-knob hip." It is a single unit that requires no assembly or special tools. Its use involves no more surgical trauma than does use of the Whitman reconstruction operation. The material is vitallium, or No. 317 stainless steel, which is absolutely non-electrolytic. The prosthesis consists of a head, a neck, a supporting disk, a trochanteric support and a threaded intramedullary shank. It is locked against rotation by a small metal block with a set screw, firmly fixed to an accurately shaped notch in the upper edge of the bone shaft. A hooked support and a screw fix the transplanted trochanter and its attached muscles to the femur. The threaded shank, about 6 inches (15 cm.) in length, is self-cutting and is shaped to screw snugly, by hand and wrench, into the medullary canal. It is adjustable to the right or the left hip. The head is shaped somewhat like a door knob. It is spherical except for a slightly flattened surface designed

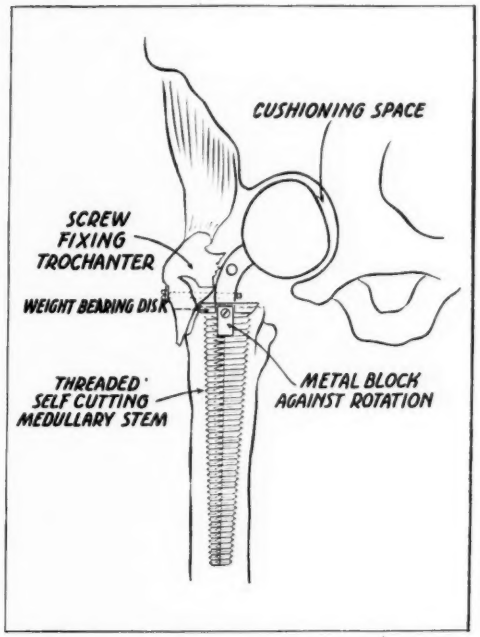

Fig. 1.—Mechanical design of prosthesis.

Results of Use of Prosthesis in 12 Cases

Patient No.	Sex	Age	Date of Fracture	Type of Internal Fixation	Previous Operations	Date of Application of "Door-Knob Hip"	Condition at Last Visit
1	F	65	1/15/47	None	10/8/47 Transverse subtrochanteric osteotomy	8/5/49	2/7/50: Walks well without support; full motion; full length; does housework; can sit, rise and cross knees readily; moderate soreness
2	F	60	11/8/47	None	11/9/48 Whitman reconstruction	3/3/49	1/25/50: Can bear considerable weight but lacks strength; walking on crutches; good motion; no pain; considerable bony atrophy
3	F	58	1/24/48	Pinned 1/27/48; screw 6/6/48; bone graft 6/16/48		4/15/49	11/21/49: Walking without support; good gait with very little limp; hip motion practically normal; hip sore and hurts when twisted; doing housework without crutches
4	F	81	7/19/47	None	11/7/47 Transverse high osteotomy	7/13/49	By letter 7/29/50: Walks with stick support; good motion; soreness; no other pain
5	M	58	8/2/47	Plates and screws—no dates	Removal of sequestae and plates (5)	11/17/49	5/17/50: Amputation; irreversible chronic osteomyelitis
6	F	70	10/3/47	Smith-Petersen nail, 10/5/47	None	12/24/48	1/25/50: Walking without support; can bear full weight but cannot balance too well; full motion; full length; knee weak; can sit and rise readily; cannot cross knees without assistance
7	F	72	12/27/48	Pinned Jan. 1949	None	1/25/50	4/7/50: Does not attempt to help herself; walks with a support; no acute pain on motion; good weight bearing without pain
8	F	77	5/10/49	Smith-Petersen nail, 5/12/49	None	9/15/49	1/24/50: Walking well; full motion; full length; lacks confidence; moderate soreness; uses stick; can sit, rise and cross legs readily
9	F	73	7/3/49	Pinned 7/6/49	None	9/8/50	10/15/50: Good range of motion; fairly free of pain; on crutches
10	F	81	2/3/50	Smith-Petersen nail, 2/6/50	None	5/12/50	9/15/50: Walking freely on crutches; no pain in hip; almost normal motion; leg length about normal
11	F	72	4/22/50	None	None	7/25/50	8/9/50: Good motion; on crutches
12	M	46	3/18/43	Smith-Petersen nail, Aug. 1943; another Smith-Petersen nail, no date	1943-44, bone graft	8/4/50	10/18/50: Good motion; some weight bearing; still on crutches; no pain

to prevent pressure on the tender cotyloid notch area of the acetabulum. This flattening also creates a cushioning pocket that relieves friction.

The head is made in various sizes and the neck in various lengths, approximating the head and neck of the femur for which it is to be substituted. The size should be selected to fit the acetabulum rather loosely. The length of the neck

should be such that the stress in reduction of the head and the linear tension of the head in the acetabulum will not be too great. The neck of the prosthesis fulfills the requirements of length of the head and neck of the femur but is shaped at an angle about 15 degrees more obtuse than the normal angle of the neck of the femur. This transmits a more direct weight-bearing line from the roof of the acetabulum through the head and into the shaft of the femur, thus eliminating ligamentous stress and muscular strain in maintaining equilibrium, motion and weight bearing. The disklike metal ledge is large enough to rest on the hard cortical bone on the cut end of the femoral shaft and thereby absorbs the greater portion of weight. The intramedullary shank is coarsely threaded as a self-cutting screw. It is large enough in diameter to occupy, tightly, the medullary canal without cutting into the cortex.

No especial apparatus is needed for seating the prosthesis except a simple wrench to assist the hands in turning the apparatus, which is smooth and becomes slippery. A reamer of suitable size may be used to start the threaded shank in the right direction into the medullary canal. A screw hole and a square-cornered notch are placed on the anterior and posterior aspects of the weight-bearing disk to receive a metal block and set screw which fits into the notch in the bone shaft of equal size to prevent rotation.

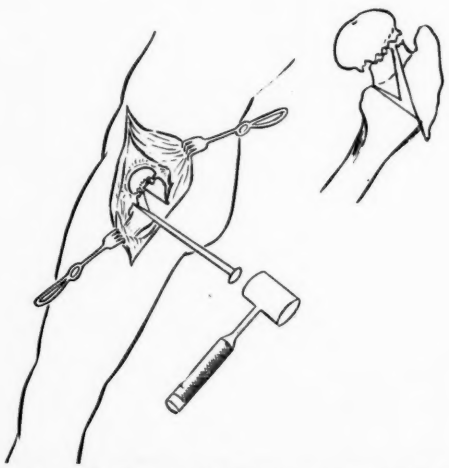

Fig. 2.—Osteotomy of trochanter, preparatory to introduction of prosthesis.

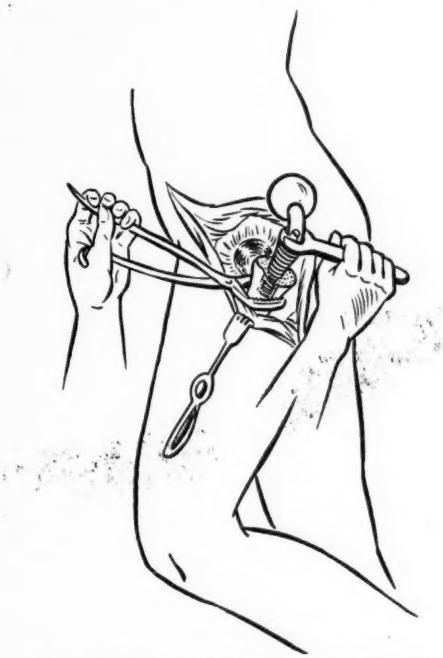

Fig. 3.—Method of introducing self-cutting threaded stem into femoral medullary canal.

Technic.—The entire leg and hip should be prepared in sterile drapes for free manipulation. The incision must be one that exposes the lateral aspect of the trochanter as well as one that permits removal of the femoral head. If there is an old scar from a previous lateral incision, it should be excised and the incision extended forward to the anterior-superior spine. If there is no scar and if the fatty thickness of the hip is not too great, the lateral U incision is preferable. (Some prefer Gibson's posterior approach.) The capsule is incised lengthwise to elevate it freely from the head, neck and trochanter. The trochanter is freed sufficiently to outline its contour, and all muscle attachments are left. All previously applied metallic fixation pins or screws are removed. A wide thin osteotome is then leveled transversely at the

Fig. 4.—Roentgenographic appearance after introduction of prosthesis.

upper margin of the lesser trochanter, and the greater trochanter is separated from the shaft. The greater trochanter is levered upward to permit removal of the femoral head. Some of the neck may be trimmed away to add space. A Campbell curved hip arthroplasty chisel is useful in removal of the head. The capsule is preserved as well as possible, even though considerable dissection is required during removal of the head.

The proper size of the substitute head is selected by inserting metal heads of different sizes into the acetabulum and testing for snugness. Reaming of the acetabulum is unncessary except where there is overgrowth or unevenness. The proper length of neck on the prosthesis is determined by placing traction (without undue leverage or force) on the extended leg to judge the prospective resistance to reduction. The upper end of the femoral shaft is then forced out into the wound by adduction, rotation and upward force, to permit screwing the shank of the prosthesis into the medullary canal. Subperiosteal dissection and retraction should be extensive enough to permit free rotation of the head and neck of the prosthesis as it is screwed into the femoral shaft. A ⅜ inch (0.96 cm.) reamer may be used to find the true direction into the medullary canal. The prosthesis is turned by hand until it binds; then the femur is held with a Lane forceps while a wrench is used on the prosthesis. The weight-bearing disk must be firmly and evenly seated on the cut end of the femoral cortex. If binding occurs, the threaded shank is rotated back and forth so that the threads will cut their way. The bone may be shaped to make it level with the weight-bearing disk before tightening. The appropriate forward angle of the head and neck is determined by comparing leg alignment. The head is reduced into the acetabulum by means of a long spoon lever and hand manipulation by an assistant. Undue leverage or force may fracture the femoral shaft. A notch is cut out of the anterior aspect of the cortex to permit accurate fitting of the metal block that is to prevent rotation. This metal block must be firmly seated with a screw. There must be no looseness at this point. The leg should be abducted for reattaching the trochanter. As the trochanter is pulled outward and downward, it is levered over the projecting hook, which aids in holding the bone in position for inserting the screw that binds its lower portion against the previously scarified cortex of the femoral shaft. The fixation screw can be forced or tapped through the soft trochanteric bone at a point that will meet the screw hole and at the same time permit overlapping of the trochanter ½ to ¾ inch (1.3 to 1.9 cm.) on the shaft. The capsular tissues and deep fascia are closed with No. 1 chromic sutures, and the remainder of the wound is closed by the whatever is preferred. No case is applied. Buck's extension (10 pounds, or 5 Kg.) is used for five days with the leg in wide abduction and sandbags applied to prevent rotation.

The patient may be turned by maintaining abduction. Exercises are begun after five days. The patient is given crutches in ten days, and moderate weight bearing

may be permitted in two weeks. Special attention should be given to exercises which develop the rotators and abductors.

SUMMARY

A hip joint prosthesis with a spherical head, designed as a single unit and fixed by a threaded intramedullary stem, is described, together with indications for its employment. Over a period of three years its use has given rise to no disappointing complications. Twelve cases are statistically reported, all with good results.

RÉSUMÉ

L'auteur decrit une prosthèse à tête sphérique pour la hanche, cette prothèse et fixée à l'aide d'un pivot intramedullaire, ainsi que les indications pour son emploi sont énumérees. L'emploi de cette prosthèse chez un malade observé pendant les trois dernières années ne donna aucune complication décourageante. L'auteur rapporte 12 cas, dans tous ces cas, les resultats furent bons.

RIASSUNTO

Se descrive una protesi pella giuntura dell'anca a teste sferica, disegnato come unito solo e fissato d'un fusto filato intramidollare nello stesso tempo l'indicazione del'avvantaggio. L'impiego durante piu di tre anni ha prodotto in nessun caso complicazione scoraggianti. Dodici casi vengono rapportati in cui i risultati furono buoni.

ZUSAMMENFASSUNG

Es wird eine kugelkoepfige Hueftgelenksprothese, die aus einem einzigen Stueck besteht und mit Hilfe eines gewundenen intramedullaeren Stieles befestigt wird, beschrieben. Gleichzeitig werden die Indikationen fuer ihre Anwendung angegeben. In dreijaehrigem Gebrauche haben sich keinerlei enttaeuschende Komplikationen ergeben. Es werden zwoelf Faelle mit durchwegs guten Ergebnissen berichtet.

RESUMEN

El autor describe una protesis de la juntura de la cadera con cabeza esférica, calculada como unidad sola y fijada con tallo intramedullar enhilado, y indica el uso. Los resultados observados durante tres años no mostraron complicaciones desfavorables. Refiere doce casos estadisticamente en los cuales los resultados fueron buenos.

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Case Report

Fatty Bilateral Inguinal Hernia

EARLE I. GREENE, M.D., F.A.C.S., AND J. MAJOR GREENE, M.D., F.A.C.S., F.I.C.S.
CHICAGO

IN the differential diagnosis of inguinal hernia, fatty hernia should be considered. This type of hernia is very rare, only 1 case having been reported in the last twenty years. Although the management of the condition is similar to that of the ordinary hernia, the prognosis is far better than for the other types of inguinal hernia.

Small fatty pads found during operation for indirect inguinal hernia are fairly common. We have found approximately the same percentage as reported by Speed, who in 154 herniotomies observed 73 cases, or 47.4 per cent, in which fatty masses were closely associated with indirect inguinal hernias. Speed further classified these masses as follows:

1. Long pedunculated masses, slightly lobulated and covered with a more or less true peritoneal-like covering which looked like a very thin sac, taking its blood supply from above.
2. Broad, bulging masses originating behind the cord at the internal ring and bulging out in the general direction of the cord, lying posterior to it.
3. Distinct fatty masses incorporated in the tissues of the cord, with an attenuated neck at the internal ring.

These fatty masses may arise from the preperitoneal fat or may come down the inguinal canal concomitantly with the descent of the testes.

In discussing the differential diagnosis between the usual inguinal hernia and the fatty inguinal hernia, Watson stated that the fatty hernias do not change in size and are irreducible, and that no impulse is present on coughing.

From the Department of Surgery, Chicago Medical School, and Mount Sinai Hospital.
Submitted for publication Feb. 16, 1951.

We desire to present a case of bilateral fatty inguinal hernia simulating bilateral indirect inguinal hernia.

REPORT OF CASE

A man aged 35 consulted us because of indefinite dragging pain, with enlarging masses in both groins. These complaints had been present for nine months. He had previously consulted a physician, who had told him he had bilateral inguinal hernia.

The past history and physical examination gave essentially negative results. There was bilateral enlargement of the external inguinal rings. A soft bulging mass, easily reducible, was felt distal to the left external inguinal ring. Coughing or straining forced this mass further through he external inguinal ring. On the right side a similar mass could be palpated just distal to the external inguinal ring, but only on coughing or straining. This mass was also reducible.

The patient was advised that he had bilateral indirect reducible inguinal hernia, and surgical intervention was recommended. He was examined again one month later, when, in addition to the former observations, the masses were found to have increased somewhat in size and to have protruded further through the external rings.

With spinal anesthesia, a right inguinal incision for repair of the hernia was made. The aponeurosis of the external oblique muscle was markedly thinned, and in areas the fibers were separated from each other. The aponeurosis was opened along the course of its fibers, from the external ring to the internal ring. The cord was identified in the region of the external ring and freed from the surrounding strictures.

A pad of fat measuring about 8 by 5 cm. completely filled the right inguinal canal and protruded beyond the external ring. An attempt to locate a peritoneal sac failed. The

fat pad, which lay anterior to the cord structures, was separated from the vas deferens and the spermatic vessels. The fatty mass was dissected well beyond the internal ring and removed. Its blood supply came from the preperitoneal region and not from the vessels of the cord. No direct or indirect hernial sac was found. A Ferguson repair was done. On the left side a similar condition presented itself. The fat pad was larger, measuring 11 by 6 cm., and protruded well beyond the external ring. This fat pad filled and dilated the entire inguinal canal, causing separation and thinning of the fibers of the aponeurosis of the external oblique muscle. The fat pad, its blood supply derived from the preperitoneal region, was dissected from the vas deferens and vessels of the cord and removed well beyond the internal ring. Neither a direct nor an indirect inguinal hernial sac could be found. An operation similar to that performed on the right side was done.

SUMMARY AND CONCLUSIONS

Fatty inguinal hernia, though rare, should be considered in the differential diagnosis of inguinal hernia. These hernias increase in size, are reducible and may give an impulse on coughing.

Treatment consists in complete removal of all fatty masses and the performance of a Ferguson repair.

RÉSUMÉ ET CONCLUSIONS

Même si elles sont rares, le diagnostic entre une hernie inguinale graisseuse et une hernie inguinale ordinaire doit se faire. Ces sortes d'hernies augmentent de volume, sont réductibles et donnent même à la toux une impulsion.

Le traitement consiste dans l'ablation complète de la masse graisseuse et dans l'application de la technique de Ferguson.

RESUMEN Y CONCLUSIONES

La hernia inguinal adiposa, aunque rara, debe de considerarse en el diagnóstico diferencial de la hernia inguinal. Estas hernias aumentarán de tamaño, son reducibles y pueden dar impulso al toser.

El tratamiento consiste en la extirpación completa de todas las masas adiposas y efectuar una reparación de Ferguson.

ZUSAMMENFASSUNG UND SCHLUSSFOLGERUNGEN

In der Differenzialdiagnose des Leistenbruches sollte auch die Fetthernie, die zwar selten vorkommt, beruecksichtigt werden. Diese Brueche nehmen an Groesse zu, sind reduzierbar und geben beim Husten einen tastbaren Stoss.

Die Behandlung besteht in einer voelligen Entfernung aller Fettmassen und in einer Wiederherstellungsoperation nach Ferguson.

RIASSUNTO E CONCLUSIONI

Ernia inguinale grassa, sebbene rara, dovrebbe essere considerata nella diagnosi diferenziale di ernia inguinale. Queste ernie cresceranno in grandezza, sono riducibile e possono dare un impulso nel tossere.

Il trattamento consiste nel rimovimento completo di tutte masse grasse ed esecuzione d'un riparamento di Ferguson.

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Editorial

The Meaning of Hippocrates in the Medical World Today

Hippocrates Prize Essay

S. V. HUMPHRIES, M.A. (CANTAB.), M.R.C.S. (ENG.), L.R.C.P. (LONDON)
LONDON, ENGLAND

HIPPOCRATES initiated the scientific approach to medicine. He stipulated that "a person possessed of proper ability, and knowing the discoveries which have been made, should proceed from them to prosecute his investigations." He condemned the former practice of "rejecting and despising" past discoveries, then attempting to pursue another course and form of enquiry. Any one adopting this procedure who claimed to discover anything was, he maintained, deceiving himself and others.

"The prime object of the physician in the whole art of medicine should be to cure that which is disease; and, if this can be accomplished in various ways, the least troublesome should be selected, for this is more becoming a good man, and one well skilled in the art, who does not covet the popular coin of base alloy." This quotation sums up the attitude of Hippocrates toward his patient; to cure, not to impress them, and to do so by the most direct and straightforward method.

Hippocrates abhorred the spectacular except when it was beneficial to the patient. In discussing the treatment of kyphosis following an old fracture of the spine, he stated that the gibbus deformity could seldom be straightened, and that succussion, or shaking the patient (a popular form of treatment in those days), had, as far as he knew, never straightened any spine. Succussion was a particularly spectacular procedure which consisted of securing the patient to a ladder which was hoisted by ropes up to a high tower, the gable end of a house, or the mast of a ship, the patient often being suspended face downward. The other ends of the ropes were passed over pulleys down to men on the ground entrusted with the task of succussion. By letting go their holds on the ropes suddenly, the patient was allowed to fall through space. By again grasping the ropes, his headlong fall was arrested.

This impressive but valueless performance was condemned by Hippocrates, who explained that it was principally practiced by physicians who sought to astonish the mob, but those whom he had known had all been stupid. Others, he explained, sought to impress their patients, and, in his description of the treatment of fractures of the nose (a serious subject in ancient Greece, where profiles were of

Editor's Note: Mr. S. V. Humphries, winner of the recent Journal competition for the best essay on Hippocrates, was born in 1907 in Middleburg, Cape Province, South Africa. He was educated at Highbury, Hillcrest and Michaelhouse, Balgowan, Natal, and studied medicine at Pembroke College, Cambridge, England, and at St. Thomas' Hospital in London. He was qualified in 1932. Subsequently he held appointments at the Royal Dock Hospital, London; Hope's Hospital, Salford, and Addenbrooke's Hospital, Cambridge. He was Medical Officer to the Van Dyk mine, Transvaal, South Africa, from 1936 to 1949, except for three years' war service in East and North Africa with the 15th Field Ambulance, South African Medical Corps. He returned to Britain in 1950 and is now engaged in medical journalism.

great importance), he poured scorn on those physicians who "gloried" in applying complex bandages for such fractures. For a day or two the patient was satisfied, after which he complained of the encumbrance of the bandage. The physician was satisfied because he had had an opportunity of showing his skill in applying a complex bandage, though the effect of the bandage had been to make the already flattened nose even flatter than before. Today, in accordance with Hippocrates's teaching, we do not bandage noses, but, as recommended by him, we introduce "something" into the nostrils to rectify the parts. He emphasized the need for immediate reduction of displacements of the nasal bones owing to the rapidity of callus formation.

Hippocrates did not favor "new" treatments unless they could be proved after a thorough trial to be effective. In explaining why he thought it necessary to give "longer directions" on the treatment of fractures, he remarked that he knew physicians who had the reputation of being skilled in the treatment of fractures as they adopted new methods. As an example he cited the fact that they bandaged the forearm, when fractured, in supination. "People rather admire what is new," commented Hippocrates, "although they do not know whether it be proper or not." Further reference to his teaching on fractures of the forearm will be made below.

Today, Hippocrates's teaching is of special value to us with regard to diagnosis and prognosis rather than treatment, with the notable exceptions of the matter of diet and the reduction of fractures and dislocations. But he also helps us in our attitude toward our patients. Since B.C. 400, medicine has changed—it has progressed—but patients have remained much the same. How familiar we are with the patients to whom he alludes who "live in the same way when sick as when in health, take what suits their appetite, and neither restrain nor restrict themselves in anything for which they have a desire." He emphasized the great importance of securing the patient's cooperation, without which, however good the physician, the desired result cannot be obtained.

In an aphorism he told us how the diet must be made to suit the patient. In another upon diet, which we should heed, he stated: "Old persons endure fasting most easily; next, adults; young persons not nearly so well; and most especially infants, and of them such as are of particularly lively spirit."

He also pointed out that harm might result from too sparse just as easily as from too liberal a diet, and that the constituents of a sparse diet should be more varied and carefully selected.

Diet was considered of the utmost importance in medicine, for he remarked, "There would be no need for the art of medicine if all men when sick could eat the same food and drink which they ate and drank when in good health."

Hippocrates attached great importance to the making of a correct prognosis, for though many diseases could not be cured, the physician should be able to tell which patients would get well and which would die. Fever, he explained, was in itself not a disease but a symptom, and not necessarily serious. He described what has now come to be known as the Hippocratic facies, and this is still of very great value to us in prognosis. If this facies could be attributed to loss of sleep, diarrhea, or want of food, he considered that the danger was not so serious, but if, with treatment directed toward the alleviation of these causes, no improvement took place, it was known for certain that death was at hand.

The posture of the patient was also studied, and his careful description of the various postures and their prognostic significance should receive the attention of every medical student. The features of *subsultus tendinum,* still regarded as a sign of extreme toxemia, were described with graphic accuracy and regarded by him as "bad and deadly."

His observations on the patient's respirations, sweating, insomnia, looseness of

the bowels, vomit and sputum with reference to their prognostic importance are of the greatest value. The gravity of black vomit was appreciated and regarded, as it was only some twenty years ago, as a herald of impending death. Now happily we have gastric suction, which saves many patients who without it would die.

The rusty sputum of pneumonia was considered a favorable sign if coughed up at the commencement of the disease, but less so if it continued to the seventh day or later. Black sputum was considered very dangerous. The prognostic significance of the various symptoms and signs of empyema were carefully assessed—far more so than they usually are today, as we have the benefit of bacteriologic and roentgen examination.

With regard to the treatment of medical conditions, some of Hippocrates' simple remedies are still employed, and his detailed dissertations on diet should perhaps receive greater attention than they now do. Hot applications of various kinds were used. Venesection was advocated for pain extending up as far as the clavicle and for acute affections if the disease appeared "strong," if the patient was "in the vigor of life" and if he was strong. For pleurisy, besides bleeding he gave a confection purgative for the robust but an enema for weaker patients.

Thus much of our symptomatic medical treatment is based on Hippocrates, or is at least very similar to his. The same applies to some of our surgical treatments, of which massage, exercises and bandaging are examples. The large arm sling for elevating the forearm and hand after fractures and other injuries was used extensively by Hippocrates. Compression was regarded by him as important, for he alluded to it several times in his works and to the ways in which it could be obtained without ill effects. Compression should, he emphasized, be obtained by the number of bandages rather than by the force of constriction. He taught how varus and valgus deformaties of the foot could be corrected by bandaging.

Hippocrates warned against the development of bed sores in patients "carelessly allowed to remain in a certain position during confinement to bed." This, he said, might take place "when in any disease a protracted decubitus takes place." He stated that the sores are inveterate, troublesome, liable frequently to break out again, and apt to be attended by very acute fevers of the continual type.

Of individual conditions, Hippocrates was particularly interested in fractures, dislocations and head injuries. In these he laid much of the foundation of our knowledge, and some of his methods of treatment are still followed in principle if not in detail. He also provided information, still of great value, on empyema, otitis media, diphtheria, Pott's disease of the spine, deformities, and epilepsy, as well as other diseases.

In the treatment of fractures, Hippocrates thought out the best positions in which a limb should be immobilized. He it was who formulated the general rule that the forearm should be put up at a right angle to the upper arm, as it could not be kept long in extension, but he added, "We must look to the part in the state of rest, in its middle state, and to habit." By habit he probably meant that the forearm should be in the position in which the patient could most easily keep it, i.e., in a large arm sling at a right angle. He also postulated that the knee should be immobilized in extension, as it was habitually extended in standing and walking.

In the treatment of fractures of the long bones, Hippocrates paid attention to the three general principles which we observe: reduction, immobilization and restoration of function. As the bones of the ancient Greeks united more quickly than ours do today, there was probably less difficulty in restoring function unless the fracture was badly reduced. Hippocrates stated the usual times for which it was necessary to immobilize fractures, viz: radius and ulna, thirty days; humerus, forty days; bones of the forefoot, twenty days; calcaneus, sixty days; Pott's frac-

ture, forty days; femur, fifty days; bones of the nose, ten days, and ribs, twenty days.

Reduction in his day, as now, was largely obtained by extension. His methods of traction for reducing a fracture of the thigh must have been very effective, for he thought that the extremities of the fragments were sometimes actually pulled apart and mentioned that "it is a great disgrace and an injury to exhibit a shortened thigh." But he, like us, did not always find it easy to obtain sufficient extension on the femur, for he referred to the fact that "particular pains should be taken in regard to the extension, that it may not be insufficient."

"When sufficiently extended," he explained, "it will be easy to adjust the bones and bring them into their natural position by straightening them and arranging them with the palms of the hands."

Immobilization was secured by very careful bandaging. The bandages were wound moderately tightly, and one gathers that Hippocrates did not have a case of ischemic contracture, or, if so, did not consider that it was caused by tight bandaging—a view which many surgeons of today would endorse—for he stated that the bandage should be applied tightly enough so that for the first day and night the patient fancied that the tightness did not diminish but rather increased; and if on the next day there was a soft swelling in the hand, this was regarded as a favorable sign; but he warned against too tight bandaging, and he stipulated that on the third day the bandage should appear loose.

No plaster of paris was used, but the limb was smeared thinly with cerate—a mixture of wax, oil, lard and other substances—to encourage the bandage to stick. The bandages were applied as we apply them while reduction was being maintained by manual or mechanical means. Splints, which he stated should be padded, were not applied until the seventh to the eleventh day, as during the intervening period improvement in the position of the fragments was aimed at.

For each individual fracture he gave explicit instructions as to how the fracture should be reduced, and his remarks regarding the treatment of fractures of both bones of the forearm are of special interest. As some of us realize from our own (sometimes bitter) experience, these fractures are not always easy to reduce and hold reduced. Within our own lifetime some authorities have advocated that these fractures should all be put up with the forearm in supination. Yet Hippocrates realized, as most of us do today, that most fractures of the forearm if put up in supination do not do well. On first reading his description one may get the impression that he favors the position of pronation, but on a more careful perusal it becomes clear that he really advocates the position midway between pronation and supination, which we now use for fractures below the insertion of the pronator teres, i.e., for the majority of fractures of the forearm—excluding fractures of the Colles type to which he does not specially refer. It is true that he did not single out fractures below the insertion of the pronator teres for this treatment, but the consequences of not adopting supination for fractures above the pronator insertion are less serious than those of adopting this position for fractures below it. The latter course results in permanent deformity, with an upturned palm and considerable impairment of function.

Fractures of the calcaneus were in Hippocrates' day apparently even more serious than they are now, being occasionally complicated by gangrene. For these fractures he advocated confinement to bed, elevation of the part, and moderately firm bandaging with the use of many bandages, the bandages being reapplied on the third day. During the last thirty years we have tried to improve on this method of treatment, but many surgeons will agree that we cannot yet be sure that we have made much, if any, improvement, except for slight alterations in the details of the technic.

He described several devices for obtaining extension in order to reduce a fracture of the lower leg, some just as ingenious as our modern orthopedic tables and screw-traction appliances. These he considered necessary, as, although the principle of applying extension was the same as for fractures of the forearm, greater force was (as we know full well) required, for, as he aptly put it, "the parts of the body concerned are stronger in this case."

Countertraction was obtained by taking a round, smooth piece of wood which was fastened deeply into the ground, the upper extremity of the piece of wood being used as a perineal strut, so that it prevented the body from "yielding to the pulling at the foot." The foot was then padded and secured with thongs of ox skin, the ends of which were secured to a pestle or other piece of wood which was inserted into the nave of a wheel, thus firmly anchoring it. The wheel was then pulled upon in the long axis of the limb to obtain extension.

The principle of this procedure is not so very unlike that employed today for the reduction of fractures of some of the long bones, and our modern methods are almost certainly based on those of Hippocrates, who had to make do with such appliances as he could get. Even the detail of having an assistant seated at the patient's side to "push back the hip so that the body may not turn round with the pulling" was mentioned by him.

Today we make use of screw-traction, and Hippocrates did in fact make use of it too, not quite by the same method as we generally do, but by means of a windlass. Regarding apparatus for reducing fractures, he advised that any physician practicing in a large city should have prepared a proper wooden machine with all the mechanical powers applicable in cases of fractures and dislocations.

Hippocrates's description of how to reduce a fracture-dislocation of the ankle joint reads almost like that of a modern text book:

"When you have made proper extension, it is easy to reduce the joint, for the displaced bone is then raised into line with the other. And the bones are to be adjusted with the palms of the hands, pressing upon the projecting bone with the one and making counter-pressure below the ankle with the other. When you have replaced the bones, you must apply the bandages while the parts are upon the stretch, if you possibly can; but if prevented by the thongs, you must loose them, and then make counterextension until you get the bandages applied." Today, happily, we have the Steinman pin to help us, so that there is no difficulty in applying our plaster bandages "while the parts are on the stretch," but some of us occasionally have patients who refuse the insertion of the pin, and then we, like Hippocrates, have to "loose" the thongs—our clove hitch round the ankle is probably not so very unlike his—and "make counterextension" until we get the bandages applied.

Fractures of the clavicle were discussed in detail. He stated that they caused no harm to the shoulder or the rest of the body and that union speedily occurred. The sternal fragment most often became displaced upward and the acromial fragment, which he regarded as the more mobile, downward. The acromial fragment ought, he argued, to be elevated by pushing the arm when at the side as much as possible upward. But in certain cases, he said, "the elbow is to be brought forward to the breast and the hand laid on the acromion of the sound side." This is the principle embodied in Sayre's method, which is still used today.

For fractures of the mandible, though Hippocrates did not wire the upper jaw to the lower as we do today by our islet method, he certainly used wire in the form of gold thread for securing distorted and loosened teeth and with the object of "keeping the parts at rest."

In his remarks upon fractures of the spine there are some significant sentences. "Displacements from a fall rarely admit of being rectified. . . Excurvation in adults speedily relieves the individual from the disease he is suffering under, but in time

it renews its attack." In other words, if you reduce a fracture of the spine, the displacement will recur. One of the latest methods advocated for the treatment of fractured spine is to employ functional treatment only, without attempting reduction at all. By this means better results are claimed than by hyperextension treatment, for, as Hippocrates (and our recent authority) stated, even if you reduce a fracture of the spine, it "renews its attack."

Dislocations, like fractures, were dealt with at length. He explained that people varied much in the ease with which their dislocations could be reduced. They were less frequent in fat people, but when they occurred were more difficult to reduce. The reverse applied to thin people. The shoulder and knee joints were most subject to dislocation in Hippocrates's day.

The symptoms and signs of dislocation of the shoulder joint were described graphically. Particular attention was directed to the value of comparing the sound with the injured side, but he warned that this may be deceptive except for one experienced in making such comparisons, "for many persons, from pain, or from any other cause, when their joints are not dislocated cannot put the parts in the same positions as the sound body can be put into."

The heel-in-axilla method of reducing dislocations of the shoulder joint for which Hippocrates's name is particularly famous was one of six methods described by him, and not, according to him, the strongest of all the methods of reduction. We do not now carry out his method exactly in the manner he described. Hippocrates said that a round ball of suitable size should be placed in the hollow of the armpit, for without something of this kind the heel could not reach the head of the humerus. A supple piece of broad thong was placed round the ball and the ends held by an assistant seated above the patient's head, who depressed the shoulder with his foot while the operator reduced the dislocation by traction on the arm with his heel in the axilla.

His information regarding dislocations of the hip joint is valuable, particularly that of anterior (inward) dislocations, which we now seldom see, but which in his day were the commonest variety. The anterior dislocation was, according to him, more serious than the posterior (outward), especially when left unreduced. The clinical signs of both varieties were given in detail. Congenital dislocation of the hip joint both unilateral and bilateral, was also accurately described.

Hippocrates had an effective treatment for congenital clubfoot and maintained that this deformity should be treated at as early a period as possible, "before the deficiency of the bones in the foot is very great, and before there is any great wasting of the flesh of the leg." The treatment consisted in "modeling the foot like a piece of wax, applying resinous cerate and numerous bandages," or "a piece of lead" was bound on—in other words, a splint. Our present treatment is not very different.

On injuries of the head, Hippocrates's teaching is of the greatest value. He classified fractures of the skull, and, though his classification was different from our present-day classification, he realized and taught some points which were and still are of vital importance.

He distinguished between a fissured and a depressed fracture. He realized that a fracture of the skull might occur not at the point struck but at some other point distant from this. He realized in his examination of the injured head that one must "ascertain respecting the hairs about the wound, whether they have been cut off by the instrument and have gone into the wound." How many skulls one opens today for the purpose of preventing infection of an open fracture and discovers beneath an indriven fragment of hair "cut off by the instrument," as Hippocrates so well described it!

He stressed the importance of a visual examination of the wound, by which means one can learn almost as much as by palpating it. He realized the difficulty in diagnosis when the weapon struck the

head over a suture, owing to the roughness of the bone in this situation. He stated that many fractures at sutures require trephining but that the trephine must not be applied to the suture itself but to the adjoining bone. He appreciated that depressed fractures were less dangerous if the dura remained intact. He emphatically stressed the importance of avoiding injury to the dura when trephining a skull. All these things are still true today, and very important.

The works of Hippocrates would form a valuable subject at medical schools in the very first year of study. By including this subject and cutting down a little perhaps on the sciences of elementary biology, the medical student would, early in his or her career, be made to understand the real meaning of Hippocrates, and through him of medicine. The student would moreover acquire early a great interest in the art of medicine, a knowledge of many fundamental and important facts, and a proper grasp of the meaning of the oath of Hippocrates upon which medical ethics are based, for Hippocrates was perhaps, above all else, a wonderful propagandist for all that is honorable and genuine in the practice of medicine.

The Sixteenth Annual Assembly
of the United States Chapter
International College of Surgeons

will be held at the Palmer House in Chicago
September 10-14, 1951

For details, write
Dr. Arnold S. Jackson, *Secretary*
United States Chapter, International College of Surgeons
1516 Lake Shore Drive, Chicago 10, Illinois

Chapter News

International College of Surgeons

United States Chapter

Arnold S. Jackson, M.D., F.A.C.S., F.I.C.S., Secretary

New York Surgical Section: The First Annual Assembly of the New York Surgical Section, initiated by Dr. Horace E. Ayers, Regent for the state of New York, was a memorable and stimulating occasion. Dr. Ayers was well repaid for his efforts in the unbounded enthusiasm evinced by all concerned. Among the prominent participants were the following:

Dr. Herbert Acuff, President, International College of Surgeons

Dr. Henry Meyerding, President, United States Chapter

Dr. Max Thorek, Founder and Secretary General

Dr. Carlton Wertz, President, New York State Medical Society

Dr. J. Stanley Kenney, President-Elect, New York State Medical Society

Dr. Louis H. Bauer, Chairman of the Board of Trustees, American Medical Association

Dr. Marcus D. Kogel, Commissioner of Hospitals, New York City

Mr. Harrision Cleveland, Delegate from the Consul General of Canada.

Dr. Walter P. Anderton, Executive Secretary, New York State Medical Society

Dr. Henry M. Scheer, Chairman, New York Surgical Section, United States Chapter, International College of Surgeons

Dr. Oswald S. Lowsley, Chairman, Foreign Relations Committee, New York Surgical Section

Dr. Henry Kessler, Medical Director of the New Jersey Rehabilitation Clinic

The climax of the occasion was reached at a dinner held in the Grand Ballroom at the Hotel McAlpin on the evening of Wednesday, March 14. After the invocation, pronounced by the Rev. Dr. Roelif H. Brooks, the program was introduced by Dr. Ayers, with Dr. Henry Kessler as toastmaster. The speakers of the evening were Dr. Acuff, Dr. Meyerding and Dr. Thorek. Guests of honor included Dr. Anderton, Dr. Bauer, Dr. Kenney, Dr. Kogel, Dr. Wertz, Dr. Edward Bernecker and Dr. Gabriel Porto of Brazil.

The organization of the Section marks an important forward move in Chapter activities. The following officers and committee heads have been installed:

Regent: Dr. Horace E. Ayers

Vice-Regents: Dr. Chester Peake, Dr. John J. Rainey and Dr. Francis R. Daniels

Chairman: Dr. Henry M. Scheer

Vice-Chairmen: Dr. Edwin A. Griffin and Dr. Joseph D. Hallinan

Secretary-Treasurer: Dr. Joseph F. Rooney

Scientific Committee: Dr. Paluel Flagg, Chairman; Dr. Bernard J. Ficarra, Vice-Chairman

Foreign Relations Committee: Dr. Oswald Lowsley, Chairman; Dr. Roy Upham, Vice-Chairman

Entertainment Committee: Dr. Sidney Weston, Chairman; Dr. Morris Weintraub,

Dr. Horace E. Ayers

Vice-Chairman

Membership Committee: Dr. Joseph Hass, Chairman; Dr. John Sauer, Vice-Chairman

Ladies' Auxiliary: Mrs. John Goller, Chairman; Mrs. John Mussio, Vice-Chairman

The *Journal* congratulates Dr. Ayers and the New York Surgical Section on the splendid success of its initial assembly.

Essay Prize Winner Announced: The prize in the recent *Journal* competition for the best essay on "The Meaning of Hippocrates in the Medical World Today" has been awarded to Mr. S. V. Humphries of London and South Africa. The prize, a $100 Government bond, has been forwarded to Mr. Humphries with the Journal's congratulations, and the winning essay appears in full as an editorial in this issue.

Recent Honors: Two Honorary Fellows of the International College of Surgeons, Dr. Elmer L. Henderson and Dr. George F. Lull, have been awarded the Carlos J. Finlay medal and scroll in Havana, Cuba, for distinguished service in the field of medicine and public health. The Finlay award is the highest medical honor in Cuba's gift.

Dr. Henderson is President of both the American Medical Association and the World Medical Association. Dr. Lull is Secretary and General Manager of the American Medical Association.

Dr. Lowsley Honored: Dr. Oswald S. Lowsley has just returned from a six weeks' lecture tour of Venezuela, Colombia, Panama and Central American countries. He gave operatic clinics and held conferences in each of the countries visited and made arrangements for many young doctors to come to the Oswald Swinney Lowsley Foundation Inc., of St. Clare's Hospital, for instruction in urologic diagnosis and surgery.

Dr. Lowsley found the attitude of the doctors much more pro-American than ever before. Many of his former students are holding key positions in their respective countries.

Appointment: Dr. Domenico Cappetta, F.I.C.S., has been appointed recently to the post of Assistant Professor of Clinical Ophthalmology at the Post-Graduate Medical School, New York University.

Israeli Chapter: The Israeli Chapter of the International College of Surgeons was organized at a meeting held in Jerusalem on Feb. 28, 1951. The following officers were elected:

President: Dr. Georg Wolfsohn, F.I.C.S., Chief, Surgical Department, Bicur Cholim Hospital, Jerusalem

Vice-President: Dr. Daniel Fritz Peyser, F.I.C.S., Director, Department of Surgery, Rothschild Hospital, Haifa

Secretary: Dr. Ernst Lehmann, F.I.C.S., Director, Urological Department, Sharon Hospital, Petach-Tiqvah

Treasurer: Dr. Ernest Wodak, F.I.C.S., Director, Otorhinolaryngological Department, Hadassah Hospital, Tel-Aviv

Dr. Neumann of Jerusalem, an officer of the Ministry of Health, was elected an Honorary Fellow of the Israeli Chapter.

Brazilian Chapter: The First Assembly of the Brazilian Chapter of the International College of Surgeons will be held in São Paulo on September 27th through the 30th, under the auspices of the Brazilian Chapter and the Government of the State of São Paulo.

The theme of the Assembly will be "Minimal Standards for Hospital Organization in Brazil."

A scientific program will be presented and each essayist will be allowed ten minutes for his presentation.

Complete details may be obtained by contacting the President of the Chapter, Prof. Dr. Carlos Gama, Rua Bahia 499, São Paulo, Brazil, or the International Secretariat, 1516 Lake Shore Drive, Chicago 10, Illinois.

Correction: In the article "Carcinoma of the Cervical Stump" by Drs. Dexter H. Witte and David W. Ovitt, appearing in the March issue of the *Journal,* a typographical error occurs in line 17, page 314. The word "not" was erroneously inserted. The line should read ". . . operation would have to be justified", etc.

General News Notes

German Surgical Society: The sixty-eighth meeting of the Deutsche Gesellschaft für Chirurgie (German Surgical Society) was held in Munich on March 28 to 31 inclusive. A highly significant program had been prepared and was excellently presented by some of Germany's foremost surgeons. Dr. Rehn of Freiburg discussed "The Prophylaxis and Treatment of Thrombosis and Embolism. Drs. Bodechtel of Düsseldorf and Vozschulte of Munich collaborated on a paper entitled "The Pathogenesis and Treatment of Chronic Painful Conditions." Drs. Hoff of Aschen and Brunner of Zurich followed with "The Pathogenesis and Treatment of Hypertension." "Treatment of Old and Recent Lesions of the Brain" was presented by Drs. Tönnis of Langendreer and Wanke of Kiel. The fifth presentation was a dual one; Dr. Boshamer of Wuppertal-Barmen discussed "Chemotherapy for Urogenital Tuberculosis" and was followed by Dr. Borminghaus of Düsseldorf on "Indications and Technic for Extirpation of the Bladder." The program closed with a paper by Dr. Hellner of Göttingen on "Sarcoma of Bone and Its Treatment."

Physicians' Art Show at A.M.A. Meeting: The American Physicians Art Association will have an art exhibit, as usual, during the A.M.A. convention at Atlantic City, N. J. June 11 to 15, 1951, inclusive. Any physician in the United States, Canada and Hawaii desiring to participate in this show should communicate with the secretary for particulars.

J. Henry Helser & Co., Inc., Investment Managers with offices on the Pacific Coast, are the new sponsors of the American Physicians Art Association and will award 200 trophies besides a special Helser Trophy —a large decorative cup depicting Yankee Ingenuity. This cup is to be awarded for art work done in any medium. Also the large Popularity Trophy will be awarded to the owner of the art piece receiving the most popular votes during the A.M.A. convention. Over 4,000 members of the American Physicians Art Association will shortly receive entry blanks, shipping labels and rules about this fourteenth art exhibition.

The Annual Art Banquet will be held Tuesday evening, June 12 at the Marlborough-Blenheim Hotel, Atlantic City, N. J. Communications should be addressed to F. H. Redewill, M.D., Secretary, American Physicians Art Association, 760 Market Street, San Francisco 2, California.

Congress on Tuberculosis and Diseases of the Chest: To stimulate discussion in Great Britain on these topics a Congress will convene in Oxford from July 16 to 21. The conference is sponsored by the Faculty of Radiologists, the Society of Thoracic Surgeons, the Tuberculosis Society of Scotland, the Society of Medical Officers of Health, the British Pediatric Association, and the British Tuberculosis Association. The Honorable Secretary is Dr. Stephen Hall, 16, Grosvenor Place, London, S.W.1.

The Association of Surgeons of Great Britain and Ireland: Manchester has been selected for the annual meeting of the Association, to be held on July 19, 20 and 21, 1951. The program includes a discussion of head injuries, infections of the hand, carcinoma of the colon, acute pancreatitis, and after-history of the amputee in peripheral vascular disease.

International Jubilee Assembly: The French Society of Gynecologists, under the auspices of the President of the Republic and the Presidency of Honor of the Ministers of Public Health, Foreign Relations and National Education, will assemble in Paris, June 23 to the 29, 1951. Arrangements for this International Congress, organized in collaboration with UNESCO, are under way.

The meetings will be held at the Centre Marcellin-Berthelot (Maison de la chimie, 28 bis Rue St. Dominique), where soundproof study rooms and a projection room will be set up. A first-rate exhibition comprising several sections, such as drugs, surgical and electroradiologic instruments, is also being organized. An exhibition of ancient documents treating of gynecology will be held under the auspices of Professor Laignel-Lavastine. Reception rooms will be assigned where the Congressmen and their families will be greeted. Lastly, a bar, a restaurant and a special telephone service will accommodate the members. Titular members of the Congress will receive two

richly bound volumes, the Jubilee Book of the French Society of Gynecology and a volume containing all the lectures of the Congress. These publications will not be available on the market. Numerous receptions and amusements will be provided as well as an opportunity to attend the festivities of the second millenium of Paris.

All requests for information or the details of registration should be addressed to Dr. Maurice Fabre, Secretaire General, 1 rue Jules Lefebvre, Paris (IXe.), telephone Trinite 44-88.

Medical Seminar at Mount Sinai Hospital, Florida: Physicians and surgeons throughout this country and Cuba are being invited to attend the First Annual Medical Seminar of Mount Sinai Hospital, Miami Beach, Florida. The event will be held on May 23, 24 and 25, 1951, at the Sorrento Hotel.

Sponsored by the medical staff of Mount Sinai Hospital, the seminar will provide another link in the comprehensive educational research program established at the hospital, which, although only fourteen months old, has already been fully approved by the American College of Surgeons and recently was approved for intern training by the American Medical Association.

Outstanding medical and surgical specialists throughout the country in the cardiovascular field have been invited to participate in the seminar. Under discussion will be various forms of heart diseases and peripheral vascular diseases from the medical, surgical, physiologic and pathologic points of view. Recent work on cholesterol metabolism also will be reviewed.

Guest speakers at the seminar will include:

Dr. David I. Abramson, Chief, Peripheral Circulatory Clinic, Michael Reese Hospital, Chicago: *Physiology and Physio-Pathology of Peripheral Vessels;* also, *Functional Vascular Diseases.*

Dr. Claude S. Beck, Professor of Neurosurgery, Western Reserve University School of Medicine, Cleveland: *Operation for Coronary Artery Disease.*

Dr. Samuel Bellet, Associate Professor of Cardiology, Graduate School of Medicine, University of Pennsylvania, Philadelphia: *The Effect of Electrolyte Alerations on the Heart with Particular Reference to the Effect of Hyper and Hypotassemia;* also, *Treatment of Cardiac Arrhythmias with Particular Reference to the Use of Recent Therapeutic Agents.*

Dr. John W. Gofman, Associate Professor of Medical Physics, Donner Laboratory, University of California, Berkeley: *Biophysical Methodology and Its Application to Medical Research;* also, *Studies of Arteriosclerosis Utilizing Biophysical Approaches.*

Dr. Seymour S. Kety, Professor of Clinical Physiology, Graduate School of Medecine, University of Pennsylvania, Philadelphia: *The Circulation and Metabolism of the Human Brain in Health and Disease.*

Dr. Charles W. Robertson, Associate Visiting Surgeon, Massachusetts Memorial Hospitals, Boston: *Peripheral Vascular Disorders: Methods of Study;* also, *Peripheral Vascular Disorders: Methods of Treatment.*

Dr. Otto Saphir, Director of Pathology, Michael Reese Hospital, Chicago: *Pathology of Arteriosclerosis;* also, *Collagen Alterations in Rheumatic Heart Disease.*

In addition to the lectures, a cocktail party and banquet will be held on May 23. Complete recreational facilities, including golfing, swimming, fishing and sightseeing parties, are being provided for the wives of visiting physicians. Similar activities can also be arranged for physicians who desire these recreations.

Further information on the three-day meeting may be obtained by writing to the Chairman, Seminar Committee, Mount Sinai Hospital, 4300 Alton Road, Miami Beach, Florida.

Registrations for the seminar will be limited to 200 physicians. The fee is $20 for practicing physicians and $7 for interns and residents. These fees include the cocktail party and banquet.

International Congress of Physical Medicine: This Congress, organized by the British Board of Management of the International Federation of Physical Medicine, will be held in London from July 14 to 19, 1952. In accordance with the regulations of the International Federation of Physical Medicine, the meetings of the Congress will be reserved for matters dealing with the clinical, remedial, prophylactic and educational aspects of physical medicine and with the diagnostic and therapeutic methods employed in physical medicine and rehabilitation.

Technical, scientific and historical exhibitions also will be arranged.

In addition to the scientific program, a

full program of social events and entertainment is being planned for the members and associate members. Arrangements for London and provincial visits of scientific and historical interest are also being made for the Congress week and the following week.

This is a preliminary notice. Full details will be notified later. Applications for the Provisional Programme should be addressed to the Honorary Secretary, Dr. A. C. Boyle, International Congress of Physical Medicine (1952) 45, Lincoln's Inn Fields, London, W.C.2.

Cuban Officers Elected: The Cuban National Society of Surgery has elected the following officers:

President—Dr. Manuel Costales Latatù

Vice President—Dr. Antonio Rodriguez Diaz

Secretary—Dr. Pedro Sánchez Toledo

Assistant Secretary—Dr. Louis Rodriguez Baz

Treasurer—Dr. Julio Ortiz Pérez

Assistant Treasurer—Dr. Tomás Armstrong

Peruvian Assembly: The Fifth Peruvian Assembly of Surgeons was held, under the auspices of the Supreme Government of Peru, in Arequipa from March 25 to 29, 1951. A meeting of a chapter of the same organization was also held at Cusco on March 30 and 31. Both were highly successful. The following program was presented:

First Theme: *Cesarean Operations.*

Speakers: Dr. Gerardo Lozada of Lima; Dr. Alberto Sanchez Moreno of Arequipa.

Second Theme: *Acute Cholecystitis.*

Speakers: Dr. Hernan Bello of Lima; Dr. Guillermo Ballon Landa of Arequipa.

Third Theme: *Exposed Fractures.*

Speakers: Dr. Eduardo Bermudez of Lima; Dr. Jorge Jaruffe of Arequipa.

Swiss Society of Internal Medicine: The nineteenth annual meeting of the Swiss Society of Internal Medicine will convene June 1 to 3 at Chur. The pathology and treatment of nephritis and the treatment of hypertension constitute the items of particular interest on the program. Those interested may communicate with Prof. Eric Martin, Policlinique Medicale Universitaire, Avenue du Mail 2, Geneva.

Registry of Hepatic Pathology: The American Gastroenterological Society has sponsored a registry of hepatic pathology, to be administered under the auspices of the National Research Council. Liver specimens obtained by biopsy or autopsy and accompanied with laboratory and clinical records will be collected and made available for research. The Armed Forces Institute of Pathology will review the material and give an opinion of it to the contributor. Forms obtainable from the Institute must accompany the material, and specimens should be sent to the Director, Armed Forces Institute of Pathology, Registry of Hepatic Pathology, Washington 25, D. C.

Congress of Military Medicine: The Thirteenth International Congress of Military Medicine and Pharmacy is scheduled to be held in Paris from June 17 to 23, 1951. An interesting program is in the making. Those interested should communicate with the Secretary General of the organization.

British Congress of Obstetrics and Gynecology: This congress will be held at Leeds from July 8 to 11, 1952. The program includes discussion of the following subjects: abnormal uterine action in labor, stress incontinence of urine, the place of the pediatrician in a maternity unit, and genital tuberculosis in the female. Those interested should communicate with the Secretary General of the congress, 32 Park Square, Leeds, 1.

International Hospital Congress: The seventh International Hospital Congress, under the auspices of the International Hospital Federation, will convene in Brussels, Belgium, from July 15 to July 21, under the chairmanship of Dr. René Sand. "Care of the Chronic Sick and the Aged" will constitute the central theme of the meeting.

The International Congress of Pathology: This Congress will meet in London July 16 to 20, 1951. A preliminary brochure will be sent to the members of the American Society of Pathologists and other interested persons. An extremely informative program is in the making.

New Books

Psychosurgery in the Treatment of Mental Disorders and Intractable Pain. By Walter Freeman and James W. Watts. Springfield, Ill.: Charles C. Thomas, Publisher, 1950. 2d ed. Pp. 638, with 187 illustrations.

The second edition of this remarkable work marks a decided advance over the first, which is saying a great deal. The first edition was based on a study of approximately 80 patients; the new edition covers the cases of a thousand or more.

The operation chiefly emphasized is prefrontal lobotomy. In preparing the second edition the authors had the double advantage of being able to present not only a great deal of new data on patients treated since the publication of the first edition but a great many pertinent facts as to follow-up on the patients in the original series.

The book begins with a concise survey of the history of surgical treatment for mental conditions and intractable pain. A careful anatomic orientation is provided, as are chapters on preoperative and postoperative management. The choice of operation for any particular case is discussed in some detail.

The high points of interest throughout, however, are provided by the rich abundance of case studies accompanied by photographs of the patients at various stages of progress. Long actual conversations are reported verbatim, some of them having taken place between surgeon and patients while the operation was actually going on. The use of local anesthesia has made possible the taking of notes of inestimable value concerning the patient's sensations, emotions and reactions.

No exorbitant claims are made. The authors omit nothing in their outspoken account of the difficulties for both the patient and his family during the rehabilitation period following the operation. An admirable and respectworthy account of what is still a comparatively new procedure, the book has the additional merit of being extremely readable and well presented.

You and Heredity. By Amram Scheinfeld. Philadelphia: J. B. Lippincott Company, 1950. Pp. 612. Illustrated by the author.

Announced as "an outstanding book on heredity for laymen", this compact volume lives up to its purpose so far as simplicity and lucidity are concerned; yet there is much in these pages to interest the professional reader. All the main points of heredity, both accepted and controversial, are discussed. The distinction between hereditary disease and congenital disease is made plain. Disease, however, makes up but a modicum of the subject matter. Physical characteristics and peculiarities are dealt with in detail, as are multiple births, anomalies, pigmentation, etc. The phenomenon of the identical Dionne quintuplets is analyzed from the genetic point of view. Life expectancy as influenced by hereditary factors is explained.

On the psychic side, the author explores talent and genius, as well as the mentally retarded, in relation to chromosomes. Child prodigies are shown to be of several widely varying types: the hothouse or forced variety, the "flash in the pan" and the genuine persistent genius type. Sexual aberrations and abnormalities are not neglected.

The author has illustrated his book with excellent charts, photographs and line drawings. Some of the charts as well as several photographs are in full color.

La Stérilité Involontaire: Evaluation des Méthodes de Diagnostic et de Traitment. By Raoul Palmer, with the collaboration of Elisabeth Palmer. Paris: Masson et Cie, 1950. Pp. 494, with 88 illustrations.

The problem of involuntary sterility is important from the individual and the social standpoint. A rational treatment must be based upon an exact and complete diagnosis. The author has studied this question for many years. He is convinced that in the majority of cases infertility results from several associated factors. For the successful treatment of this condition all the etiologic factors, main and accessory, should be recognized and corrected.

Normal fertility calls for the integrity of all of a series of physiologic mechanisms: spermatogenesis, sperm emission, ascension of the spermatozoa into the female genital pathways, ovogenesis, ovulation, reception of the ovum by the fimbriae of the fallopian tube; fertilization and segmentation of the fecundated ovum; tubal migration of the ovum; nidation of the ovum in the uterine cavity, and maintenance of the corpus luteum.

All the aforementioned factors are scientifically analyzed and discussed.

Both mates must be subjected to tests to determine whether the aforementioned processes are correctly functioning at the appropriate time.

The first part of the work is devoted to a discussion of diagnostic methods and the tests to be employed. The second part is devoted to treatment of the etiologic factors. For each of the causative factors the treatment and prognosis is stated.

The book is a valuable addition to professional knowledge. It is based chiefly on the clinical experience of the author. It is a book to be recommended.

Encyclopedia of the Eye: Diagnosis and Treatment. By Conrad Berens and Edward Siegel. Philadelphia: J. B. Lippincott Company, 1950. Pp. 272, with 76 illustrations, 42 in color.

An encyclopedic source of reference on the diagnosis and treatment of ocular diseases, alphabetically arranged and implemented by a comprehensive index, is here presented. Almost every aspect of the subject is included. The fine illustrations, particularly those in color, furnish an additional advantage to the student or reader. Nurses and social workers, as well as those directly responsible for diagnosis and therapy, will find in this work a valuable informative aid.

Surgery of Cataract. By Daniel B. Kirby. Philadelphia: J. B. Lippincott Company, 1950. Pp. 695, with 339 illustrations, including 52 subjects on 21 color plates.

Here is a comprehensive monograph on the nature and therapy of cataract by a recognized authority in the field, superbly illustrated and clearly written. For so highly specialized a work it is focused to a remarkable extent on the concept of the patient as a whole, which is becoming more and more widely recognized as a *sine qua non* of successful practice.

Dr. Kirby is a scholar and writes like one. The book is supplied with a rich background of historical and literary allusion that speaks of wide and attentive reading and research on the humanitarian as well as on the scientific side. The text that follows is completely modern in both approach and follow-up. There are five principal divisions: *The Development of Cataract Surgery, Preparation for Cataract Surgery, Present-Day Cataract Surgery, The Correction of Aphakia,* and *Results Obtained in Cataract Surgery.*" "I have chosen," says the author, "the items which have been most helpful to me in a practical way in the achievement of the purpose of cataract surgery, namely, the restoration of vision to the patient." Liberal quotations from other authors are included throughout, and the author's own technics are presented in meticulous detail.

The color plates are admirable, as good color plates always are, for clarification of the delicate problems involved in ophthalmic surgery. The drawings and halftone illustrations are equally good of their kind. This is, in short, a decidedly valuable book and should be welcomed by specialists in the field.

Functional Anatomy of the Limbs and Back. By W. Henry Hollinshead. Philadelphia: W. B. Saunders Company, 1951.

This book emphasizes the statement that it is impossible to discuss function without discussing the morphologic basis underlying that function. It is impossible to limit a work of this type strictly to the limbs and back. Hence, other parts of the body have correctly and of necessity been included.

The book is elementary in that it is primarily written for the student with little or no formal training in human anatomy. Correctly, confusing synonyms have been reduced to a minimum.

In the main the pen and ink drawings have been kept simple and are quite illustrative. The superimposition of arrows upon given muscles to depict the direction in which the muscular fibers contract do much to clarify muscular action.

The section dealing with the hand, although quite abbreviated, is especially well done.

The book is well and clearly written and nicely printed. It can be recommended as an excellent introduction to students whose background in pathology and anatomy is not great, and can further be recommended as a reference book to those who have had some training in the aforementioned subjects.

Terapia Chirurgica dei Tumori Maligni della Vescica. By Giorgio Nicolich. Genoa: Artigiani Grafici, 1950. 65 illustrations.

The author presents an excellent book on malignant tumors of the urinary bladder, amply illustrated with roentgenograms and

anatomic plates. He adheres to Huckel's 1934 classification, which seems concise and clear. Among the various technics of ureterointestinal anastomoses, those of Coffey and Tichoff-Stiles are his favorites. A preference for the hypogastric approach in complete cystectomy is expressed. The indications for roentgen therapy and endoscopic diathermocoagulation are reviewed; the results are tabulated, with a comparison of personal cases and those of other authors. A plea for early diagnosis is made. The object of this book—to present the diagnosis and treatment of urinary bladder tumors in a compact volume which is valuable not only to the urologist but to the general surgeon—has been achieved.

Injuries of the Ankle. By J. Grant Bonnin. New York: Grune and Stratton, 1950. Pp. 412, with 399 illustrations.

Although a number of monographs on this subject have been produced by the French, this treatise is one of very few to present the same subject in detail, in the English language. The author has based his presentation on the "collected results of the last ten years in a field which extended over voluntary, County Council, Emergency Medical Service and Military hospitals, and spread from Suffolk to Sumatra."

It is in the presentation of multitudinous details, learned only by careful observation and prolonged study, that this volume excels. Also of value is the attempt by the author to standardize the present-day confusing terminology of injuries about the ankle. In addition, the subject of strain radiography gains fresh, well-deserved impetus, and a strong plea for early open reduction, particularly in the borderline cases, is proffered, along with some very convincing proof. The discussions on normal anatomy, surgical anatomy and radiography, including a section on arthrography, are concise and pertinent.

This volume will be well received by the surgeon who strives for a perfect result in each and every case.

The Italian Chapter of the International College of Surgeons Annual Assembly, Florence, Italy May 4 and 5, 1951

President of the Italian Chapter: Prof. Dr. Luigi Torraca, Professor of Clinical Surgery, University of Naples.

President of the Assembly: Prof. Dr. Antonio Comolli, Professor of Clinical Surgery, University of Florence.

Secretary of the Assembly: Prof. Dr. Gaetano Mangione, Assistant Professor of Clinical Surgery, University of Florence.

For complete information concerning the Assembly, please address the International Secretary General, 1516 Lake Shore Drive, Chicago 10, Illinois.

Abstracts from Current Literature

Gynecologic Mortality. Finn, W. F.: Am. J. Surg. 1:755, 1950.

The scantiness of the literature on gynecologic mortality is discussed by the author. He reported 140 deaths occurring on the gynecologic service of the New York Hospital from September 1932 to December 1948, an incidence of 0.68 per cent. Since 17,665 operations were performed, with 75 deaths, the postoperative mortality was 0.42 per cent. Autopsies were performed in 77, or 55 per cent, of the cases.

Cancer was the immediate or remote cause of death in 104 cases (74.3 per cent). The chief immediate causes of death were infection (24.4 per cent), embolism (19.3 per cent), gynecological cancer (18.6 per cent) and renal failure (17.1 per cent). The leading remote causes of death were cancer of the ovary (31.1 per cent), cancer of the cervix (17 per cent) and cancer of the endometrium (8.6 per cent). Other immediate causes of death were respiratory (9.3 per cent), cardiac (6.4 per cent), shock (2.8 per cent) and nongynecologic cancer (4.3 per cent).

Respiratory deaths are on the decrease, owing to improved anesthesia, chemotherapy and better preoperative and postoperative care. With the use of early ambulation and anticoagulants as well as other measures the incidence of fatal emboli has been reduced since 1947. Renal insufficiency was the direct cause of death in 24 cases, 19 of the patients having cancer which caused renal obstruction. This brings out the undeniable fact that there should be a closer relation between the urologist and the gynecologist.

There were 9 deaths from cardiac disease. The patients represent a group of poor surgical risks and as a consequence need adequate medical consultation, evaluation and treatment.

In this series 3 patients died from hemorrhagic shock due to intraperitoneal hemorrhage. This can be prevented by having and utilizing adequate blood. It is realized that treatment of the shock is merely supportive treatment preparatory to ligation of the bleeding vessel. The patients who died of nongynecologic cancer died of cancer of the bladder and cancer and lymphosarcoma of the pancreas and lymph nodes. It is to be noted from this series that the mortality rates of infection and hemorrhage were not materially reduced or altered but that there were fewer deaths from embolism.

The author states that gynecologic mortality will be reduced if (*1*) more attention is paid to a history of bowel disturbances; (*2*) peritonitis is detected when accompanying pelvic masses are present; (*3*) perforation of the bowel with peritonitis and/or retroperitoneal abscesses is suspected after roentgen therapy; (*4*) antimicrobial agents are used more promptly; (*5*) tubal insufflation is performed only in the first half of the menstrual cycle; curettage is not performed simultaneously; (*6*) early rising and movement is encouraged; (*7*) the patient with pain in the calf, unexplained fever or an increase in the sedimentation rate is treated prophylactically as though thrombophlebitis were evident; (*8*) renal obstruction is detected earlier; (*9*) the gynecologist has had urologic training; (*10*) pulmonary edema and atelectasis are detected earlier and treated more promptly; (*11*) respiratory and/or cardiac irregularity is noted promptly by the anesthetist and heeded by the surgeon, and (*12*) elective operations are not performed when the surgical risk outweighs the need for surgical intervention.

CHARLES C. ABBOTT, M. D.

Pulmonary Lobectomy. Ryan, B. J., Surgery 27:551-558, 1950.

The author reports on 134 consecutive lobectomies without a death. In the foreword by Frank B. Berry, attention is called to the remarkable advances made in this branch of surgery. The fact that 125 of the pulmonary lobectomies were done by surgical residents attests to the accomplishments of the residency training program.

Bronchiectasis accounted for the majority of lesions requiring lobectomy. The results were considered generally good even when bilateral lobectomy was necessary.

Chronic pulmonary abscess was the second most common condition requiring lobectomy. There were one-third as many cases in this group as in the group with bronchiectasis. The results in this group were gratifying when one recalls the mortality rate for this condition in former years.

Bronchiogenic carcinoma, tuberculosis, bronchial adenoma, bullous emphysema and chronic organizing pneumonia were each present in very small numbers. In addition, one

case of each of the following made up the group: asperigillosis, Boeck's sarcoid, bronchiectasis and tuberculosis, bronchiogenic carcinoma and tuberculosis, bronchiogenic cyst, coccidiodomycosis and nonspecific granuloma.

The importance of maintaining an adequate airway and a dry tracheobronchial tree and of providing sufficient oxygen during and after the operation is stressed.

In no case was a tourniquet lobectomy done. The hilar structures were dissected out and ligated individually in all cases.

Twenty-five of the patients had more than one lobe removed at operation, and 13 patients had two entire lobes removed at the same operation.

Constant vigilance during the first seventy-two hours after the operation is most important. Postoperative tracheal suction is routine. Good nursing care is essential.

Atelectasis, empyema and bronchopleural fistula are the most frequent complications.

The most remarkable feature of this report, aside from the fact that 134 pulmonary lobectomy operations were performed consecutively without a fatality, is the fact that there was a 99 per cent follow-up. Only by such excellent follow-up is it possible to know just how much justification there is for this operative procedure. Judging from the results obtained, one must conclude that pulmonary lobectomy is an extremely effective and relatively safe procedure for the therapy of many common pulmonary conditions.

M. O. CANTOR, M. D.

A Better Understanding of Uterine Contractility Through Simultaneous Recording with an Internal and a Seven-Channel External Method. Caldeyro, R.; Alvarez, H., and Reynolds, S. R. M.

The contractility of the human uterus during labor is recorded simultaneously by internal and external methods. The integration of results obtained by each method allows a much more complete understanding of uterine contractility than when either method is used alone.

In order to produce a normal and quick labor, the best characteristics of uterine contractility are as follows:

1. Large absolute intensity of the contractions of the whole uterus. 2. Strong fundal dominance. 3. Good synchronization between the different contractile parts of the uterus. 4. Regularity in the rhythm, intensity and form of the contractions. 5. Descent of the amniotic pressure during relaxation to the level of normal "tonus."

When uterine contractility deviates from these characteristics, labor proceeds more slowly or does not take place at all.

EDMUND LISSACK, M.D.

Lung Cancer Operability: Angiocardiographic Study of 53 Consecutive Proved Cases of Lung Cancer. Dotter, C. T.; Steinberg, I., and Holman, C. W., Am. J. Roentgenol. and Rad. Therapy. **64**:222, 1950.

When the mediastinal and pulmonary blood vessels are observed to be opacified when studied angiocardiographically, the surgeon can often determine whether there is present a benign, circumscribed tumor that tends to push the vessels apart or whether he is dealing with an invasive growth that may even partly or completely occlude a major pulmonary artery. Angiocardiography is therefore proving of immense value in the diagnosis of operability of pulmonary neoplasms and may often be of value in enabling the surgeon to visualize more thoroughly the pathologic conditions present and to plan what particular procedure should be attempted.

RICHARD A. LEONARDO, M.D.

Imperforate Hymen with Hematocolpos. Daniel, Walter W., South. Surg. **16**:473, 1950.

Imperforate hymen is not common, but it is quite important clinically. It is produced by the failure of the centrally located epilhelial cells of the posterior wall of the hymen to degenerate. This naturally prevents the mucus and blood from flowing out of the vagina, and they begin to dam back, producing in order hematocolpos, hematotrachelos, hematometrius and hematosalpinx. If the hymen is not taken care of, one of two things may happen—it may rupture or an infection may develop. This condition must be considered in differential diagnosis whenever amenorrhea is associated with difficulty in urination and pain in the lower part of the abdomen.

The treatment consists of making cruciate incisions to allow the dammed-up fluid to run out slowly, then excising the central area and suturing the cut edges. Postoperatively, Fowler's position is desirable.

EDMUND LISSACK, M.D.

Intussusception in the Adult. Donhauser, J. L., and Kelly, E. C.: Am. J. Surg. 79:673, 1950.

The authors have analyzed 665 cases from the literature of intussusception in persons over 15 years of age and have added 12 new cases from the files of the Albany Hospital. The ages varied from 15 to 90 years, with great predominance in the group between 15 and 30. The patients were predominantly male. The most common etiologic factor was intestinal tumors of various sorts. Following these were Meckel's diverticulum, prior gastroenterostomy, prolapsed gastric mucosa and a long list of less common lesions. Of the tumors in the series, 213 were benign and 123 were malignant.

Of the so-called primary intussusceptions, 68 per cent were ileocecal, ileoileal and ileocolic; 19 per cent were colocolic, appendicocecal and cecocolic. The remaining 13 per cent consisted of various other types.

The authors urge a more specific classification based on the portion of intestine involved. They suggest the following classification: gastroduodenal, jejunogastric, duodenoduodenal, duodenojejunal, jejunojepunal, ileojejunal, ileoileal, ileocecal, ileocecocolic, appendicoappendical, appendicocecal, cecocolic, cololic, sigmoidosigmoidal, sigmoidorectal, colorectal and ileocolic.

The most common symptoms were nausea, vomiting, irregular recurrent attacks of colicky pain, and constipation. Abdominal masses were present in half the cases. Abdominal tenderness, rigidity and melena were least frequent. As obstruction becomes more complete, the usual signs and symptoms develop.

HOWARD STERN, M. D.

Intravenous Infusions of Invert Sugar. Weinstein, J. J., Med. Ann. 19:179-182, 1950.

In an effort to solve some of the nutritional problems of the surgical patient, particularly with regard to increasing caloric intake, the author studied the effect of administration of 5 per cent dextrose and 5 per cent invert sugar. Cooperative male patients in the surgical wards were used.

As a result of this clinical study, the author found that equal quantities of invert sugar may be given twice as fast as dextrose and yet the amount lost in the urine will be only one-tenth of that noted with dextrose. This suggests that ten times as much dextrose as invert sugar would be lost to the patient. For this reason, to increase the caloric intake of the postoperative patient it is suggested that invert sugar may be used instead of dextrose for intravenous infusion.

M. O. CANTOR, M.D.

Obliteration of Pain at the Site of Reference by Intradermal Infiltration Anesthesia in First-Stage Labor. Abrams, A. A., New England J. Med. 243:636, 1950.

This clinical study seems to bear out the referred character of pain in first-stage labor, indicating a simple method by which it can be relieved either completely or to a large extent. The effectiveness of the anesthesia is simultaneous with its administration, which in no way causes an alteration of the uterine tone or of the frequency, intensity and duration of uterine contractions.

Intradermal anesthesia is useful in first-stage labor in that pain during the greater part of the labor is abolished without the use of sedatives, which cause depressing effects, particularly on the baby. This type of anesthesia produces no local or systemic complications and requires no special knowledge or special aftercare. The technic of infiltration is simple and can be used in the home as well as in the hospital.

EDMUND LISSACK, M.D.

Endometriosis: A Report of 400 Cases. Fallon, J.; Brosnan, J. T.; Manning, J. J.; Moran, W. G.; Meyers, J., and Fletcher, E. M.: Rhode Island M. J. 33:15, 1950.

This paper is excellently illustrated. It points out that endometriosis in women is more frequent than appendicitis and that its manifestations extend into many medical specialties. The cardinal symptom is cumulative increase of menstruation with some linked phenomenon, usually pelvic pain; the pathognomonic sign is the characteristic "feel" of an endometrioma. This is best appreciated by simultaneous rectovaginal examinations. The cardinal symptom and the pathognomonic sign are often lacking, and a more helpful method of diagnosis is to suspect the disease in women who are not having children. It does occur in youth also, contrary to general belief.

Peritoneoscopic study is indicated when doubt exists.

EDMUND LISSACK, M. D.

The "Milk Factor" in Carcinoma of the Human Breast. Horne, H. W., New England J. Med. 243:373, 1950.

In an ingenious study Horne investigated the family histories of a series of women with cancer of the breast. Eighty-eight patients were chosen who, together with their mothers, were still living. A control group of 86 patients who had undergone external gynecologic procedures and in whom no neoplastic process had been discovered was also selected. The average age of the two groups was the same.

The question of whether the child had been nursed by the mother was examined carefully. Among the patients with cancer, 9 had never received any human milk, and among the patients of the control group 7 had never received any human milk.

Horne concluded that a woman may have cancer of the breast without ever having received any human breast milk.

M. T. FRIEDELL, M.D.

Hyperthyroidism, Pregnancy and Thiouracil Drugs. Bell, G. O., J.A.M.A. 114:1243, 1950.

Bell studied 21 women in whom Graves' disease and pregnancy of less than six months coexisted. In each instance therapy with thiouracil drugs was followed by surgical intervention and the results were very satisfactory, nor was there any maternal mortality. However, there occurred loss of the fetus in a third of the cases, and because of this the author emphasizes the fact that overtreatment with antithyroid drugs should be avoided, and that thyroid and iodine therapy may be advisable after thyroidectomy to prevent the possibility of hypothyroidism, which in his opinion may be an important factor in fetal mortality. The author also thinks that diethylstilbestrol may be indicated in these cases until after parturition.

RICHARD A. LEONARDO, M.D.

The Value of Punch Biopsy for the Diagnosis of Icterus in Retention (Valeur de la ponction-biopsie dans le diagnostic dea icteres par retention). Caroli, J., Acta Gastro-Enterologica Belgica 13:111, 1950.

The differential diagnosis between intrahepatic and extrahepatic obstructive jaundice without exploratory operation is often difficult, and the difficulty may not be resolved even by extensive consideration of the values recorded for various laboratory tests. It is desirable to establish a diagnosis of nonsurgical jaundice without adding abdominal laparotomy to the patient's troubles. For this purpose the author regards punch biopsy of the liver with the Silverman needle as a safe and useful procedure, and mentions that he has performed more than 200 such examinations with safety. However, he regretfully admits that in those cases which are most difficult to diagnose by clinical and laboratory means the liver biopsy is least likely to provide a clear-cut answer. In some cases it is impossible to arrive at conclusion regarding the site of obstruction without laparotomy. Noting that an exploratory operation in the presence of jaundice is dangerous, the author advises exploration by palpation and inspection supplemented by radiomanometric examination of the ducts (apparently operative cholangiography with measured pressures).

The author discusses various theories concerning the mechanism of regurgitation of bile. It is his opinion that the pathologic-histologic pictures of jaundice due to intrahepatic obstructions and that due to extrahepatic obstructions are similar; he has observed ectasia of the intertrabecular biliary capilliaries in both types of obstruction. He considers that jaundice of hepatogenous origin is caused most often by obstruction of these capillaries at the level of the canal of Hering, at the periphery of the lobule between the ampulla of the capillary and the portal bile ductule. However, he has been generally unable to demonstrate the exact site of obstruction in numerous sections made from specimens secured by punch biopsy. He admits it to be extremely unlikely that a section of liver showing intact portal areas may be secured by this method and states that ordinary methods of fixing and staining fail to show even the bile lying in ectatic capillaries. Since he considers that paraffin has a part in the absorption of the bile in the specimen, he uses a technic of staining with iodine before fixation and imbedding.

The article is illustrated with diagrams of the possible mechanisms of obstruction, photomicrographs of specimens secured by punch biopsy, and photographs of cholangiograms secured by radiomanometric examination at laparotomy.

LOUIS RIVER, M.D.

Biliary Lithiasis in the Young (La lithiase biliare des jeunes). Chiez, M.; Debray, C., and Delattre, P., Acta Gastro-Enterologica Belgica. 13:89-99, 1950.

This paper is a discussion of cholelithiasis as observed by the authors in patients who acquired the disease before the age of 30, and characterized by a different clinical and pathologic picture from that ordinarily noted when the disease occurs in older persons. They describe as typical the association with endocrine and neurovegetative disorders, particularly those concerned with ovarian function. True colic is considered rare, and the gallbladder can usually be visualized fairly well, although the shadow indicates atony and emptying is poor. The stones are stated to be generally pure cholesterol, small, and showing only by contrast with the opaque medium. The appearances of the gallbladders at operation, as well as the pathologic examination of its walls, indicate to these authors that the inflammatory changes observed are not erreversible. It is considered that cholangiographic study carried out during the operation and later through the drain in the gallbladder supports this opinion, and hence that surgical intervention, when it becomes necessary, should usually be limited to cholecytostomy. Cholecystectomy is considered the operation of choice only in case there is evident disease of the gallbladder wall or when radiomanometric cholangiography indicates obstructive disease at the neck of the gallbladder.

LOUIS RIVER, M.D.

Massive Gastrointestinal Hemorrhage due to Jejunal Diverticula. Koxoll, D. D.; McMahon, J. A., and Kiely, J. P., J.A.M.A. 142:1258, 1950.

This paper presents a detailed investigation of a patient who, after falling on the ice and fracturing his hip, began passing quantities of blood in his stool. The authors measured the quantity of liquid black stool passed and, since it was nearly all blood, used that as a postulate for the total blood loss together with the usual hematologic criteria. Blood replacement was undertaken to keep loss and restitution in balance.

An exploratory laparotomy was performed, with negative results except for multiple diverticula of the upper part of the jejunum, with pink bowel and no apparent evidence of contained blood in its lumen. The abdomen was closed, nothing having been done. Continuation of the hemorrhage led to reoperation a week later, at which time the diverticula-bearing area of jejunum was resected, with ultimate recovery of the patient.

Much is made of the fact that this is only the seventh case reported in the literature of hemorrhage from jejunal diverticula and the fourth case with morphologic observations in its support. There were multiple mucosal erosions in many of the diverticula.

The fact that at the first operation no dark contents were observed in the bowel below the jejunal diverticula, and yet that the patient had bled severely, are a little difficult to assess and leave a feeling that perhaps the hemorrhage may not have been from the diverticula after all. However, the recovery and continued well-being of the patient lend support to the author's theory. The fact that the patient was apparently syphilitic is not particularly stressed. A graph of blood loss and repletion, an artist's drawing of the lesion, two photographs of the resected specimen and two microphotographs add completeness to an interesting presentation.

LYON H. APPLEBY, M.D.

Gastric Ulcer Occurring After Vagotomy. Morrissey, D. M., Brit. M. J. 2:651, 1950.

These 2 case reports cover patients who had been operated upon previously, by transthoracic vagotomy with transdiaphragmatic conformation, the other by laparotomy with vagotomy.

Both cases are well described. The acid levels in the first case both before and after vagotomy are portrayed by graph and in the second by record before vagotomy only. In both cases gastric ulcer developed within six months of operation for *duodenal* ulcer, with no evidence of gastric ulcer present. In both cases reoperation was done; in the first case for symptoms, in the second for hemorrhage. In a partial gastrectomy was done, with apparent cure.

The postulate is that vagotomy confers no protection against subsequent gastric ulcer and is unsuitable for treatment of this lesion. Two graphs, a photograph of a resected stomach with twin ulcers and a short bibliography completes the record.

It would appear that gastric resection is still the yardstick by which other operations, such as vagotomy for ulcer, must be measured.

LYON H. APPLEBY, M.D.

A New Surgical Procedure in Scoliosis Therapy. Reith, P. L.; Hopkins, W. A., and Dunlap, E. B. Jr., South. Surg. **16**:368, 1950.

The use of staples inserted across an epiphyseal plate to produce unilateral arrest of epiphyseal bone growth is meeting with the endorsement of orthopedic surgeons everywhere. The authors report from the Emory University Hospital on the use of these staples for the correction of scoliosis. The report is a preliminary one of a single case.

A combined thoracic and orthopedic surgical team approached the curve in the thoracic spine by division of the eighth, ninth and tenth ribs. After insertion of one staple a roentgenogram was obtained to verify the level of insertion. Three staples were then inserted across the intervertebral space of each of the intervals between the eighth, ninth, tenth and eleventh dorsal vertebral bodies. Two staples were inserted across the space between the seventh and eighth and the eleventh and twelfth vertebral bodies, making a total of thirteen staples.

Although the curves of scoliosis present a more complex mechanical problem than does the simple arrest of longitudinal bone growth, it is stimulating to read that the authors have attempted to correct this deformity by the use of staples. Reports of the end result will be awaited with great interest.

Les Diverticules du Duodenum. Boulvin, Roch: Acta Gastro-Enterologica Belgica, 13:161-172, 1950.

A brief review of the literature on duodenal diverticula is divided into sections on incidence, classification, sites, symptoms and diagnosis. The author considers that the mortality of surgical intervention for this condition, stated in 1936 to be approximately 10 per cent, should be no more than 2 or 3 per cent at present. He reports in detail the cases of 6 patients operated upon by him; 1 death occurred in this series, from acute necrotizing pancreatitis. During the dissection, in this case of a large diverticulum of the second portion from the adherent pancreas, there was considerable bleeding, difficult to control; in retrospect it was considered that gastrectomy with duodenal exclusion would have been preferable to persistent attempts to dissect the diverticulum free. The author believes that too little attention has been paid to the hyperacidity so frequently associated with a duodenal diverticulum, especially if the latter occurs in the first or second portion. Excision of the diverticulum has little curative effect on the psuedoulcerous syndrome found in many of these patients and none at all in those who have concomitant ulcer. Simple excision is felt to be applicable only when there is no hyperacidity and resection is physically possible without great risk. The author sets up some considerations of importance regarding the advisability of surgical intervention for duodenal diverticula. First: silent lesions, discovered incidentally, should not be treated surgically. Second: those producing only mild symptoms should be seen by the surgeon only after an adequate trial of medical management. Third: before operation is performed the surgeon must be sure that the digestive disturbances present are due to the diverticulum and not to lesions of adjacent organs. Fourth: since peri-Vaterian diverticula are the most frequent, it is well to recognize that many of them are accompanied by functional or organic disease of biliary or pancreatic passages, aggravated (or perhaps initiated) by the effects of retention at the neck of the diverticulum. It is noted that peri-Vaterian diverticula with complicating involvement of surrounding structures may require almost complete mobilization of the duodenum and resection of all the first portion and most of the second, along with subtotal gastrectomy. The author considers that in such cases gastrectomy is justifiable as an exclusion operation and for its effect in reducing acidity when the diverticulum is associated with ulcer. He describes a method of management which in his opinion will improve results and diminish operative morbidity and mortality.

Louis River, M. D.

New Pressure and Vacuum Pumps: The firm of George A. Thiberg, Cedar Knolls, New Jersey, has recently begun the mass production of pressure and vacuum pumps which are small and compact in design yet efficient in operation. Many uses for them will be found in laboratory and medical fields. Boonton Molding Company molds the housing parts with American Cyanamid Company's Beetle Plastic. As a result, the units are silent in operation and can be turned out economically in quantity.

The air pumps are available in two models. Model 1 can be obtained either as an air pressure pump or as a vacuum type. Model 2 is an air pressure type in a larger size.

Model 1, which measures 4" in height and 3" in diameter, delivers approximately 800 cc. per minute and has a maximum pressure of about 4 to 6 pounds.

This model is used as a vacuum pump in the surgical and hospital fields. It is claimed to be superior to the cumbersome vacuum pumps and devices used in the past. It creates a vacuum of about 12 feet of water and has proved useful as a pump for circulating air or gas in a closed vessel. Clinically it has been used in intratracheal suction; in the treatment of atelectasis, etc.; in thoracic, transdiaphragmatic and vesical operations, and in cases of abdominal distention.

Model 2 pump is slightly larger unit, measuring 5½" in height and 4" in diameter. It has a much larger output of air (approximately 3,000 cc. per minute) and will give a maximum pressure of 8 to 10 pounds. Since maximum pressure of 8 to 10 pounds.

Basic Amine Available: The New Product Development Department of the American Cyanamid Company announces the availability of 3,3'-iminobispropylamine in trial-lot quantities. This compound is a colorless, high-boiling, strongly basic amine. It is completely miscible at room temperature with water and most common organic solvents.

3,3'-iminibispropylamine has been found useful in the synthesis of ion exchange resins. The distributors state that its potentialities as an intermediate for the preparation of surface active agents, pharmaceuticals and dyestuffs should be investigated, since its linen structure and the three-carbon separation between amine groups differentiate it from other available polyamines.

New Product Bulletin No. 19, covering the physical and chemical properties of this new amine, and experimental samples will be supplied upon request to New Product Development Department, American Cyanamid Company, 30 Rockefeller Plaza, New York 20, New York.

Oxygen Tent and Humidifier: The new O-Plus oxygen tent is available in two sizes for the administration of oxygen to infants (12" diameter), children and adults (20" diameter). The construction and shape of the tent permit maximum circulation of oxygen and uniform distribution of temperature throughout, thereby washing out the CO_2 completely and preventing cold spots from forming, which reduces the possibility of the patient's catching a head cold.

Among the construction features are: an oxygen inlet baffle for equal dispersal of oxygen; an ice chamber for cooling purposes; an oxygen concentration meter for accurate oxygen-air ratio; a built-in thermometer, and CO_2 outlets. The tent is made of Dupont lucite, providing complete visibility from all sides for both nurse and patient. Because it is made of two separable parts, it is easy to clean; there are no seams to break open. The tent also contains an inlet that permits it to be used in penicillin therapy treatment.

The O-Plus humidifier can be used in conjunction with the tent where high humidity is required. The new O-Plus humidifier provides a method of administering vaporization, humidity or inhalation to patients with respiratory diseases, such as croup, acute laryngotracheal bronchitis and pneumonia. It is claimed to be the first free-acting nebulizer ever applied to creating high humidity, combining this high humidity with high oxygen content. The humidifier automatically establishes a fixed intensity, spread, velocity, volume and quality of fog.

Some of the features of the humidifier are as follows: it produces controlled high or low humidity up to 100 per cent; it produces extra fine fog; it responds accurately to sensitive adjustments; it is a true mechanical humidifier with no moving parts; no special trained personnel are required.

The O-Plus humidifier, flexible in adaptability, can be used with any oxygen tent, can be attached directly to the oxygen regulator to save space, and can be attached to a face mask for direct administration of oxygen or humidity.

In Memoriam

WILTON PAUL TILLY, SR.

M.D., F.I.C.S.

Dr. Wilton P. Tilly, founder and head of the Tilly hospital and clinic of New Iberia, Louisiana, died suddenly in January at the age of 64. A graduate of the University of Tennessee in 1911, Dr. Tilly did postgraduate work at Loyola University in New Orleans and at several clinics in St. Louis. His internship was served at the University of Tennessee at Nashville. Before taking up residence and practicing in New Iberia, Dr. Tilly was for many years visiting surgeon at the Louisiana Charity Hospital and the Hotel Dieu, both in New Orleans, and was visiting surgeon and consultant of the Belvedere Sanitarium, New Orleans, and the Veteran's Hospital, Gulfport, Mississippi. At one time he was the owner of St. Rita's Surgical Infirmary in New Orleans, with which he aided the Sisters of Mercy in their hospital career in Louisiana. Dr. Tilly has been for some years associated with the Postgraduate School of Loyola University in teaching positions in the Departments of Bacteriology, Pathology and Surgery. His practice was devoted to general surgery.

Dr. Tilly was a past president of the Iberia Parish Medical Society and a member of the American Medical Association, the Louisiana State Medical Society, the Louisiana Third District Medical Society, the Southern Medical Society and the International College of Surgeons.

WALTER CHARLES FRENZEL

M.D., A.I.C.S.

On Nov. 26, 1950, Dr. Walter Charles Frenzel of Wausau, Wisconsin, died at the age of 51. Dr. Frenzel was graduated from the University of Illinois medical school and did postgraduate work at the University of Vienna in 1936. He served his internship at St. Anthony's Du Padua Hospital. A member of the surgical board of St. Mary's Hospital of Wausau since 1927, Dr. Frenzel had served also as chairman of the Nursing School since 1939. From 1926 he was an instructor in gynecology at St. Mary's School of Nursing.

In addition to holding the status of associate in the International College of Surgeons, Dr. Frenzel was a member of the American Medical Association, the Marathon County Medical Society and the Wisconsin State Medical Society.

AUSTIN R. QUIGLEY

M.D., F.A.C.S., A.I.C.S.

Austin R. Quigley, 65, died on April 16, 1950, in Maysville, Kentucky, where he had been practicing for many years. Dr. Quigley was graduated from the University of Louisville in 1907. During his period of postgraduate study he served on the visiting staffs of hospitals in Rochester, Boston, Chicago, St. Louis, Philadelphia and Louisville. His hospital internship was served at the May Street Infirmary in Louisville. Since 1911 Dr. Quigley had been a surgeon at the Maplewood Hospital in Maysville.

Dr. Quigley was a member of the following medical and surgical societies: the American Medical Association, the American College of Surgeons, the International College of Surgeons, the Southern Medical Association, and the Kentucky State and Mason County Medical Associations.

FRANCIS EDWARD JACOBS

M.D., A.I.C.S.

Recently Francis Edward Jacobs passed away at the age of 47. A graduate of the University of Oregon medical school, Dr. Jacobs completed postgraduate study at the San Diego County General Hospital and served his hospital internship and residency in surgery there. He also held a teaching position at the Nurses' Training School at the San Diego County Hospital. Primarily his practice was devoted to general surgery.

Dr. Jacobs was a member of the American Medical Association, the California Medical Association and the San Diego County Medical Society. He was also an Associate Fellow of the International College of Surgeons.

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CALENDAR OF MEETINGS

May, 1951

21-25 .....Société Internationale de chirurgie orthopédique et de traumatologie
Stockholm
Dr. J. Delchef
34, rue Montoyer, Brussels

July, 1951

International Society of Blood Transfusion
London
Centre national de Transfusion sanguine
M. Bernard Rouzet
6, rue Alexandre Cabanel, Paris

September, 1951

3-7 .....International Anesthesia Research Society
London
Mr. R. W. Cope
University College Hospital, W C 1
London, England

10-14 .....United States Chapter, International College of Surgeons in conjunction with the Canadian Chapter
Palmer House, Chicago
Dr. Arnold S. Jackson
1516 Lake Shore Drive
Chicago 10, Illinois

October, 1951

1-6 .....Congrès de l'Association française de Chirurgie
Paris
12, rue de Seine, Paris 6ème
Prof. Brocque
Congrès francais d'Oto-Rhino-Laryngologie
Paris
Dr. H. Guillon
6, avenue MacMahon, Paris

December, 1951

American Medical Association Clinical Session
Dr. George F. Lull
535 North Dearborn St.
Chicago 10, Illinois